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The Marine Observer

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THE MARINE OBSERVER

A QUARTERLY JOURNAL OF MARITIME METEOROLOGY PREPARED BY THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE

VOL. 59 **No. 306** **OCTOBER 1989**

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COVER PHOTOGRAPH: A House Gecko (*Hemidactylus sp.*) taken in the Indian Ocean on 19 April 1989 by Mr R.C. Cornish, Chief Engineer Officer on m.v. *Botany Bay* (now *Nedlloyd Tasman*).

Letters to the Editor, and books for review, should be sent to the Editor, The Marine Observer, Meteorological Office, Eastern Road, Bracknell, Berkshire RG12 2UR

LONDON: HER MAJESTY'S STATIONERY OFFICE

Editorial

There is nothing particularly original about the notion of climate change. A rise in surface temperature, attributable to an increasing concentration of carbon dioxide in the atmosphere, caused by the burning of fossil fuels, was a view propounded by the British air pollution specialist G.S. Callendar as long ago as 1938. It has regrettably taken almost half a century for the world to wake up to the fact that concerted action is urgently needed now to reduce global air pollution, before serious thought can be given to the task of reducing the harmful greenhouse effect.

Whilst scientists have long felt certain that their predictions of the greenhouse warming effect, represented by an estimated rise of surface temperature of between 0.3 and 0.7 °C over the past century, have a major significance for human-kind, the world-views of statesmen, politicians and business people have been hard to change.

These problems, and others concerning the identification, impact and potential remedies in respect of the greenhouse effect, were addressed at the *World Conference on the Changing Atmosphere*, held at Toronto in June 1988. The report of conference is summarized later in this edition, and there is enough in it to demonstrate the deep concern felt about the damaging effects of greenhouse warming and depletion of the ozone layer. It is encouraging to read of the many scientific bodies which have responded positively to the urgent call for proposals to combat the menace to the global environment. Of several moves already undertaken to safeguard global security, the U.K. Government's *Saving the Ozone Layer Conference*, held in London in March 1989, showed that the problems can only be solved by communal action. Already 33 countries have signed the Montreal Protocol on chlorofluorocarbons (CFCs), committing governments to a fifty per cent cut in atmospheric chemical production by 1999, and a further 20 countries have indicated a willingness to do so. On 5 June this year the WMO Executive Council, sitting at its 41st annual session, had as a major topic on its agenda the issue of global climate change, with many decisions taken for protection of the atmosphere, and in preparation for the *Second World Climate Conference*. The concept of a World Environment Day on the same date as the holding of the Council, is in some way appropriate. Perhaps a far greater awareness of the decline of their living environment, a decline taking place because of their own combined actions, is needed by the peoples of the world to try and bring home to everyone the need for remedial measures, before the damage becomes irreversible and the Earth, and all in it, goes into immutable decline.

Every item of observed weather data, no matter how small, goes towards increasing our knowledge of global climate, and of the changes that are taking place. Many shipboard observers may not be aware of the importance to long-term climatology of their meteorological logbook records, perhaps assuming that once the coded observations for the synoptic hour have been logged and transmitted, by whatever means, the most important part of the process is satisfied. Nothing could be further from the truth. Firstly the real-time data are routed to many parts of the world via the Global Telecommunication System, of which Bracknell is a major world centre. Then, after undergoing quality control to smooth out possible inconsistencies, these records are permanently housed in the ever-growing store of information, including the Marine Data Bank, showing the usefulness of all weather records coming from ships and other marine units.

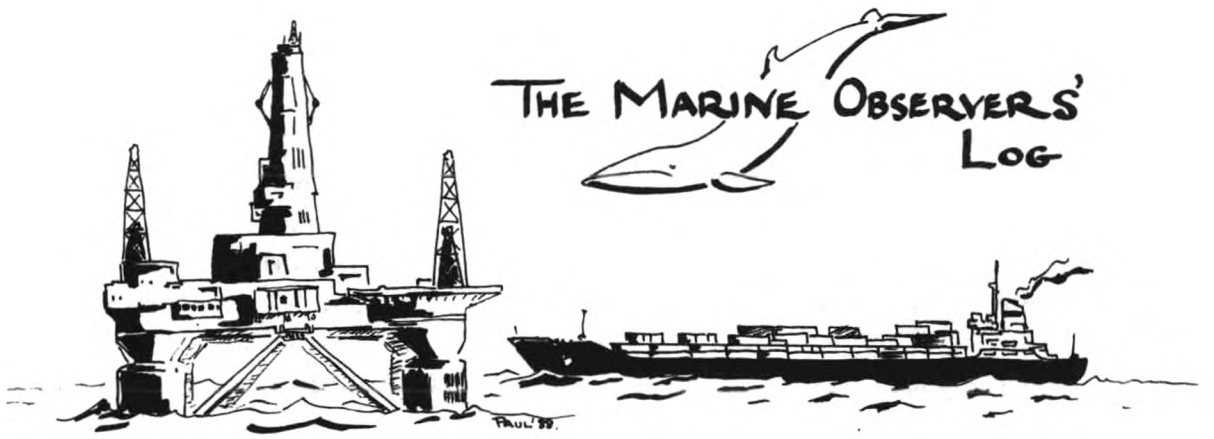
We are fortunate in having additional co-operation from observers on the oceans, adding to our knowledge by their assistance in a variety of ongoing special projects. There are now about 46 ships from 6 countries participating in the Voluntary Special Observing Project (VSOP), North Atlantic. Including 9 U.K. VOF ships, they are helping to identify the optimum sites for weather observing instruments on ships with a variety of rigs. Thirteen merchant ships are also installed with radiosonde launching outfits and experienced operators to man them, providing additional vital upper-air data in the North Atlantic and North Pacific.

Despite some losses of primary funding and of manpower, replacement methods are soon to be found to carry out the tasks of sufficient importance. A case in point is the termination of the North Atlantic Ocean Stations Agreement (NAOS), due to be wound up on 30 November 1989. NAOS has been the body responsible for the administration of Ocean Weather Ships in the North Atlantic for the past 8 years, but these specialist vessels have been in existence in the region since 1949. The three Ocean Weather Stations will no longer be manned in the same way as before, but the United Kingdom at least, has arranged to continue operations independently with O.W.S. *Cumulus*, and that ship's continuing presence will ensure that the U.K's contribution to the burgeoning Composite Observing Systems-North Atlantic scheme will continue. The Royal Netherlands Met. Service has agreed to an extension of the loan to the U.K. of their Weather Ship until the end of 1992, and this will allow the ship to be deployed in varying locations in the Western Approaches as dictated by climatic considerations. Meanwhile, the last manned Trinity House light vessel, *Channel*, was withdrawn from service in June and replaced by an automatic version. Also fitted on this new unmanned light vessel is the second Marine Automatic Weather Station (MAWS), thus allowing the station weather reports to continue in shipping forecasts. The first MAWS was installed to the new *Smith's Knoll* unmanned light vessel, coming into operation earlier in 1989 and replacing *Dowsing* in the shipping forecast station reports. However, there are now only 13 automatic light vessels around the British coasts, compared with the total of 50 manned light vessels once maintained by Trinity House, starting with the Nore station in the River Thames, established in 1832.

The relocation of the Marine Division and some other branch offices is not expected to cause disruption to the journal's publication schedule, nor to the other important operations concerned with the receipt and processing of marine data. The office relocation involves a move of only a few hundred metres, in the autumn, to London Road, bringing us to within hailing distance of the Headquarters building in Bracknell. This relocation may help us to keep even more up-to-date with the action in the meteorological field.

The other impending change within the Met. Office is the graduation to Executive Agency status, scheduled for April 1990. This also will hardly be noticed by friends and clients except as a continuation of a gradual increase and improvement to our public and commercial services. The introduction of more comprehensive meteorological and climatological information services for industry and commerce has been an ongoing feature of the Office's marketing strategy for some years. Contact addresses and telephone numbers are listed on page 210. Meanwhile, let us pray and hope that all our processes take full advantage of all the initiatives being launched to save the World from possible ecological decline.

J.F.T.H.



October, November, December

The Marine Observers' Log is a quarterly selection of observations of interest and value. The observations are derived from the logbooks of marine observers and from individual manuscripts. Responsibility for each contribution rests with the contributor.

SEVERE TROPICAL STORM 'TESS'

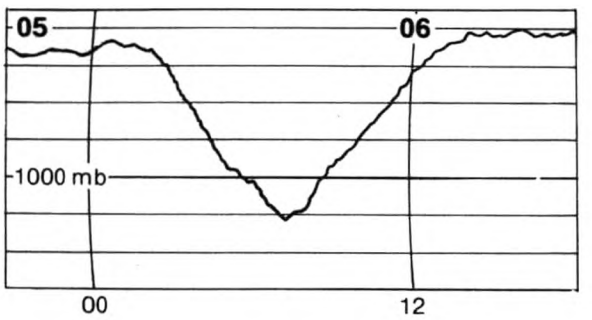
South China Sea

m.v. *Osaka Bay*. Captain J.D. Thomson. Singapore to Hong Kong. Observers: the Master and ship's company.

5–7 November 1988. The ship sailed from Singapore at 0000 GMT on the 5th; weather reports from Meteo Hong Kong and facsimile maps from Tokyo indicated that tropical depression Tess was located over the central part of the South China Sea. At 0600 the warning received from Hong Kong revealed that Tess had intensified into a severe tropical storm with a central pressure of 985 mb, and was centred within 60 n.mile of 10° N, 115° E, moving west-north-west at 10 knots. This put Tess to the north-east of the vessel's intended course and would cross ahead of it at 100–200 n.mile. For most of this day, the weather experienced was moderate, NE'ly winds of force 5/6 and a moderate/heavy swell from the north-north-east.

At 0000 on the 6th, Tess was in position 10° 42′N, 111° 06′E and was moving west-north-west at 12 knots with a central pressure of 976 mb. The ship was beginning to experience a very heavy north-easterly swell and so the speed was reduced to ease the pitching motion. At this time the ship was on a course of 034° moving at 16 knots.

At 0300 Tess was in position 11° N, 110° 30′E with a central pressure of 970 mb. The ship's position was 09° 06′N, 109° 48′E and so the course was altered to 075° to ensure that the storm passed at a safe distance of approximately 130 n.mile. The wind had increased to W×S'ly, force 8/9 by 0600, the pressure was 999.6 mb and there were confused, heavy swells. Minimum pressure at the ship was registered at about 0730, as shown on the barograph trace. From 0700 the wind began to decrease, being SW'ly, force 8 at 1000.



By 1044 conditions had eased enough to allow an alteration of course to 017° and an increase in speed to 19 knots. Tess, by this time was making its way towards the coast of Vietnam where it weakened and was downgraded to a tropical depression by the early hours of the 7th.

Position of ship at 0000 GMT on the 6th: 08° 57′N, 109° 27′E.

Position of ship at 1044 GMT on the 6th: 10° 21′N, 111° 20′E.

HEAVY WEATHER

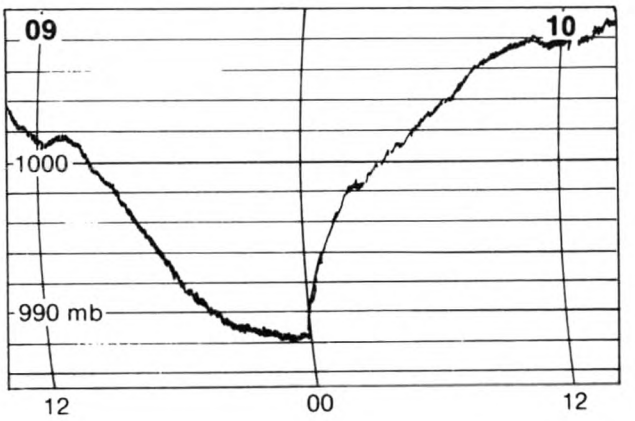
Mediterranean Sea

m.v. *City of Plymouth*. Captain P.J.S. Bishop. Haifa to Dublin. Observers: the Master, Mr P.W. Jackson, Chief Officer, Mr B.P. Murphy, 2nd Officer, Mr D. Neill, Cadet and ship's company.

7–10 December 1988. During this period, the vessel experienced weather associated with a depression in the central Mediterranean.The vessel departed Haifa at 2000 GMT on the 7th and a course was set to pass south of Crete to Cape Corrienti (Sicily), having noted on weather maps two small depressions over the Aegean and a shallow 'low' of about 1010 mb over the northern Sahara. The following observations were made between the above dates, and the barograph trace shows the pressure changes at the ship. All times are GMT.

Date and time	Remarks
8th/1000:	Wind E'ly, force 3, pressure 1017 mb. Course of ship 284°, speed 14.16 knots.
2200:	Wind SE'ly, force 3, pressure 1014 mb. Course of ship 284°, speed 14.07 knots.
9th/0000:	Fax map shows previous north Saharan low to be over Libyan Sea, and deepened to 998 mb, forecast to move north-east.
0600:	Wind SE'ly, force 5–6, pressure 1008 mb. Course of ship 284°, speed 13.7 knots.
1000:	Wind S'ly, force 8, pressure 1003 mb. Course of ship 282°, speed 13.5 knots.
1400:	Wind S'ly, force 8, pressure 1000 mb. Deposit of red sand noted on weather side of ship. Sky heavily overcast and tinged with a golden colour — believed to be Saharan sand. Course of ship 282°, speed 11.5 knots.
1800:	Wind S'ly, force 9–10, pressure 992 mb. Very rough sea with long, heavy south-westerly swell. Vessel shipping water over decks and hatches. Severe rain squalls and intense sheet lightning noted. Course and speed of ship as above.
2200:	Wind S'ly, force 9, pressure 989 mb. Very high sea and swell. Intense showers continuing. Vessel shipping water and spraying over all. Course of ship unchanged, speed 11.3 knots.

At 2330 a marked shift in the wind direction occurred as it veered to NW'ly, force 8. At the same time, the pressure started to rise rapidly from 988 mb, and



over the next two hours it rose by 10 mb to reach 998 mb by 0200 on the 10th. By 0600 the wind was N'ly and had decreased to force 7 and the thundery showers had ceased. With the wind at NW'ly, force 6 by 1400, and the pressure at 1008 mb, the vessel's speed was increased and the weather improved to moderate showers.

Position of ship at 1000 GMT on the 8th: 33° 35'N, 31° 18'E.

Position of ship at 1400 GMT on the 10th: 35° 57'N, 18° 00'E.

DEPRESSIONS

North Atlantic Ocean

m.v. *Osco Edmo*. Captain T.R. Misra. Algeciras to Boston, Ma. Observers: the Master, Mr B.K. Jha, Chief Officer, Mr A.P. Rath, 2nd Officer, Mr J.S. Netto, 3rd Officer and Mr B. Singh, Radio Officer.

18–28 November 1988. The vessel departed Algeciras on the afternoon of the 18th. The intended route was for it to proceed on a rhumb line course of 282° from Gibraltar to north of the Azores and then follow a course of 294° for Boston.

After three days of blue skies and heavenly weather, a fax report from Bracknell indicated a low of 986 mb in position 52° N, 50° W; the vessel at this time was 1,300 n.mile south-east of its centre. The pressure was approximately 1010 mb, and there was a fresh, NW'ly wind.

Fax transmissions on the 21st and 22nd from Bracknell reported that the central pressure of the low was decreasing further; at 1512 GMT on the 22nd, its pressure was 966 mb in position 46° N, 52° W. At the ship, the pressure remained steady at 1007 mb. A later report indicated that the centre of the low had become a group of three smaller centres, having pressures of 970 mb, 970 mb and 966 mb.

On the 23rd at 0000, approaching altostratus clouds were sighted, and the pressure started falling at the rate of nearly 7 mb every three hours. By 0100 the ship was encountering overcast skies with altostratus and nimbostratus clouds, a typical sign of an approaching warm front. The pressure fell to a minimum of 987 mb by 0800 by which time the wind speed had increased to force 8 and backed to SW'ly in direction. The course was altered and the vessel headed due south so as to avoid the very rough seas and heavy swell which were being encountered. At this time, the seas were estimated to be around 5 m with an accompanying swell of 6 m. The pressure was unsteady, rising to 993 mb but falling again to 988 mb and the wind was gusting W×S'ly, force 8. The vessel was about 600 n.mile from

the centre of the low-pressure system. At approximately 1800, the pressure started rising slowly and the wind speed decreased to force 7; cumulonimbus and stratus clouds covered the sky as the vessel was once again set on course for Boston.

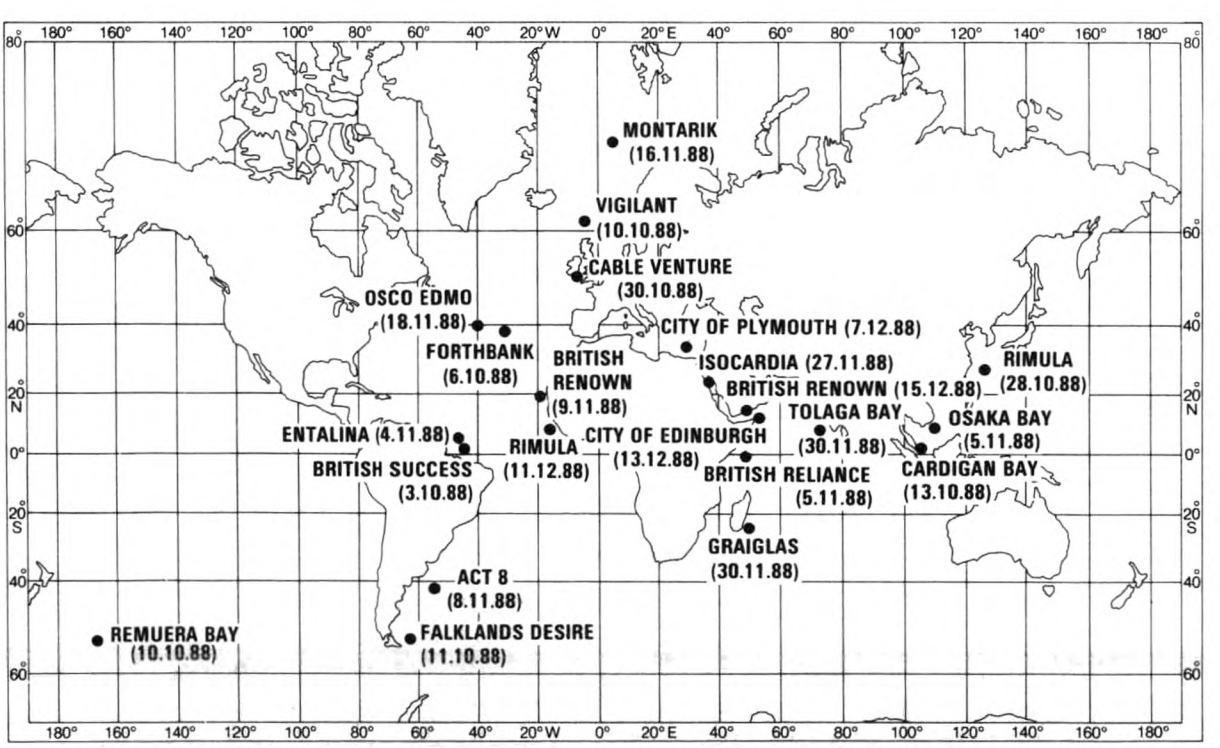
During the period from the 24th at 1200 to the 25th at 0900, the pressure remained nearly steady, reading about 1008 mb, but started falling again afterwards. A fax report from Halifax indicated that the centre of the low was located at 44° N, 46° W and that its central pressure was 959 mb; the ship was about 400 n.mile from it. The wind speed had, by this time, increased from force 9 to force 11/12, and it continued unabated for the next nine hours during which period the sky was completely covered by altostratus cloud. By 1100, nimbostratus was also being noted and it was assumed that the vessel was near a warm front. Visibility was reduced by driving spray and the air temperature fell, then remained steady. Seas and swell of 10–12 m were encountered, both from the south-west, and the pressure hovered around 990 mb.

By 0300 on the 26th, the pressure had started to rise as the wind speed decreased to force 7 and stratus engulfed the sky. Information from Halifax at 1800 indicated that the centre of the system was at 52° N, 46° W with a central pressure of 947 mb. The pressure at the ship rising again by 2100 and reached a high of 1000 mb only to fall to 990 mb by the morning of the next day. Lightning, unaccompanied by thunder, was observed on the western horizon.

Finally, by 0900 on the 27th the pressure had started to rise, cumulonimbus clouds were dissipating while altocumulus formed, and a cold front was assumed to have been passed. By the morning of the 28th, the winds had decreased further to force 5/6 and brought about an end to an eventful trans-Atlantic passage.

Position of ship at 1200 GMT on the 21st: 38° 42′N, 21° 42′W.

Position of ship at 0000 GMT on the 27th: 39° 42′N, 43° 54′W.



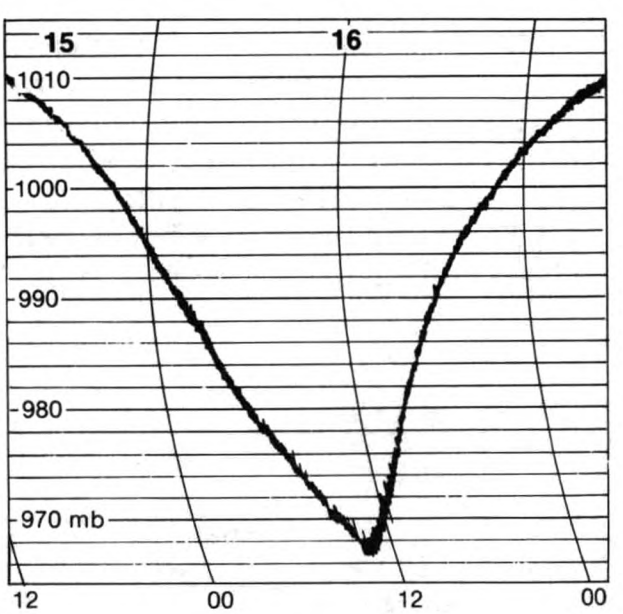
Position of ships whose reports appear in *The Marine Observers' Log.*

Norwegian Sea

m.v. *Montarik*. Captain W.F. Jeffery. Longyearbyen to Caen. Observers: the Master, Mr S.R. Ali, Chief Officer, Mr S.H. Hasseb, 2nd Officer and Mr A. Khan, 3rd Officer.

16–17 November 1988. Whilst on a course of 162° the vessel experienced a storm the centre of which was estimated to be a few miles to the east of the ship's position. The following report has been compiled from the ship's deck and met. logbooks, and the barogram illustrates the pressure characteristics. All times are GMT.

Date and time		Wind Dir'n	Force	Dry-bulb temperature (°C)	Pressure (mb)
16th	0000	050	6	0.0	992.4
	0300	050	7/8	0.0	983.6
	0600	340	8/9	0.0	975.2
	1000	340	11	0.0	968.0
	1200	340	10/11	−0.5	983.4
	1800	300	10	−1.0	1002.5
17th	0000	300	6/7	−2.0	1010.5
	0600	300	5	−0.5	1012.6



There was no damage to the ship as the sea was following, but there was heavy rolling and pitching at times and seas were shipped over the deck on several occasions. The highest seas were estimated by the Master to be in excess of 15 m. Heavy rain and snow showers were also experienced.

Position of ship: 70° 10′N, 05° 00′E.

SANDSTORM

Western Mediterranean

m.v. *Hampshire*. Captain R.A.F. Edwards. Alongside, Port Bethoua. Observers: the Master and ship's company.

17 October 1988. At 1100 GMT whilst the vessel was loading, it was noticed that the sky to the south was becoming very orange in colour, a sandstorm was

Opposite page 176.

Photos. by M.K. Jelfs

Photo. by D. Harnett

Above: Bats found on board m.v. *Rimula*. (See page 178.) Left: Spider Crab brought on board m.v. *Cable Venture*. (See page 179.) Below: Locusts captured on board m.v. *Isocardia*. (See page 183.)

Photo. by R. Orange

Opposite page 177.

Above: Presentation of barographs at Bracknell Headquarters on 19 May 1989. Standing, left to right: Mr B. Crisp (U.K. Director, Cunard Line Ltd); Mrs T.D. Ridley; Captain W.R. Houghton-Boreham (Operations Manager, Blue Star Ship Management Ltd); Dr J.T. Houghton (Director-General, Met. Office); Captain A. Syme (Marine Representative, Ben Line Containers Ltd); Dr P. Ryder (Deputy Director, Forecasting Services, Met. Office). Seated, left to right: Commodore T.D. Ridley (Nautical Advisor to Cunard Line Ltd); Captain D.V. Newlin, Retd (Blue Star Ship Management Ltd); Captain T. Fyfe, Retd (Ben Line Steamers Ltd); Captain J.R.G. Hannah (Fleet Operations Manager, P. & O. Containers Ltd). Below: Captain T. Fyfe receives his Long-service Award from the Director-General of the Met. Office. (See page 199.)

suspected and so extra moorings were run out. At this point, the air temperature was 27.0 °C, the wet bulb read 23.8, pressure was 1010.0 mb and the wind was WNW'ly, force 3.

From this time on, the wind backed and was SSW'ly, force 5 at 1500. By then, the sun had been obscured and it became very dark, dark enough to need deck lights, and sand could be seen and felt whilst outside; the sky was a very dark orange. These conditions persisted until 1700 when the visibility began to increase from the earlier estimation of 2 n.mile, the sand also became less dense and the sky began to brighten.

By 2000 the phenomenon had passed and normal conditions returned as a large-scale sweeping-up operation was started.

Weather conditions at 1500 were: air temperature 27.5 °C, wet bulb 17.2, pressure 1006.5 mb.

Position of ship: 35° 49'N, 00° 15'W.

SEA TEMPERATURE

Western South Atlantic

m.v *ACT 8*. Captain L.R. Bell. Wellington to Zeebrugge. Observer: Mr D.G. Spooner, 2nd Officer.

8 November 1988. At 1030 GMT the sea temperature (from the engine-room intake) was noted to rise to 15 °C in the space of approximately 5 minutes; the intake had been recording a steady 7°.

At first, the gauge was considered suspect, but the temperature remained constant at the higher value and was verified using the sea-water bucket. The vessel had been making good a speed of 20 knots prior to this event, and such a strong current was encountered that the speed dropped to 16.8 knots. By 1430 the speed had increased again to 20 knots, the sea temperature remained at 15°.

It was concluded that the vessel had experienced the meeting of the Falkland current and the Brazil current although this seems to have been encountered farther south than was expected.

Position of ship: 41° 36'S, 53° 34'W.

Note 1. Mr J.B. Clark, of the Ocean Current section, Met. Office, comments:

'*Admiralty Pilot No. 5 (South America, Vol. I)* indicates that the south-west going (warm) Brazil current meets the north-east going (cold) Falkland current not far from the position in which the temperature change was noted. However, the change recorded by the *ACT 8* is outstanding in that the above pilot suggests that in this neighbourhood such a change normally occurs over a distance which ranges between about 250 n.mile in August and 600 n.mile in February.'

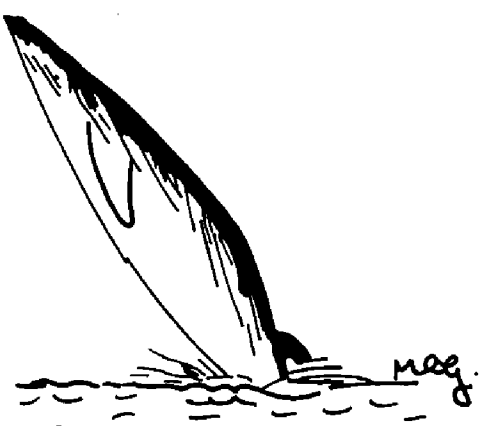
Note 2. Since this observation was assessed, a photograph has been received from R.R.S. *Bransfield* which shows a view by the NOAA–11 satellite of the confluence of the Falkland current and the Brazil current. The image, taken some seven days after the *ACT 8* observation, shows how such a sudden change in the sea temperature could have been produced. (See photograph opposite page 193.)

CETACEA

Southern Indian Ocean

m.v. *Graiglas*. Captain G. Watson-Wood. Saldanha Bay to Kaoshiung. Observers: Mr M.R. Gover, 2nd Officer and Mr D. J. Murray, Radio Officer.

30 November 1988. At 0900 GMT a large splash was seen about 1.5 n.mile ahead of the vessel fine on the starboard bow. Looking through binoculars, it could be seen that there were two sets of 'blows', with another being noted briefly on the port bow. For 20 minutes the blows were seen regularly at intervals of 5, 6 and 7 seconds. The blows were short in height, about 1.5–2.0 m, and were quite thin. Whilst blowing, the tops of the bodies could be seen, they were dark-grey or black and approximately 7–8 m long, no fins were seen at any time during blowing. As the binoculars were being put down in exchange for a camera, one of the whales decided to jump out of the water, see sketch; this took the observers by surprise and gave them only a glimpse of the whale which, unfortunately, did not jump again.



The colouration noted when the whale leapt was that it had a very white belly and pale-grey or silver flanks with a dark-grey or black back. Its visible flipper was quite small and white, whilst the dorsal fin, seen for the first time, was a long way down the back and very small. The whale did not completely leave the water, but its length was estimated to be about 15 m.

For the first 15 minutes of the observation, the whales maintained their distance, but for the last few minutes, the ship gained on them, closing to about 0.5 n.mile, at which point the whales dived without showing any flukes. It was thought that they may have been Fin Whales.

Position of ship: 24° 23′S, 49° 59′E.

BATS

Eastern North Atlantic

m.v. *Rimula*. Captain J.L. Taylor. Cape Lambert to Rotterdam. Observers: the Master, Mr M.K. Jelfs, 3rd Officer and Mr A. Wilson, 3rd Officer.

11 December 1988. At 1000 GMT a single bat was seen flying erratically around the ship's accommodation block. When in flight, its wings were just about transparent. It landed in a shaded area between the wheel-house and funnel, where a photograph of it was taken (shown opposite page 176). The bat remained in this position for about 10 minutes after which time it flew off,

eventually to come to rest on the main deck, in the shade of the boat deck. In colour, the bat was a medium brown, and had quite dense fur; its head seemed to be large when compared to the rest of its body.

At 1500 another bat was seen; this one was dark brown in colour and was much smaller than the first, being only about 6 cm long. It was first spotted by the Chief Engineer Officer's wife, who promptly informed all on board with an ear-splitting scream. The bat, which seemed to be worn out and to have a damaged leg, went to sleep and was later moved to a position in the shade beneath a ventilator, where it continued to sleep. Some two hours later, it was noticed to have gone, and neither bat was seen again.

Position of ship at 1000 GMT: 09° 00'N, 16° 31'W.

Note. Mr J.E. Hill, formerly of the Mammal Section, British Museum (Natural History), comments:

'The first of these bats is quite clearly a free-tailed bat (family *Molossidae*) probably *Tadarida condylura*, a fairly common west African species. The second photograph is of a different one, probably the Long-fingered bat *Miniopterus*, and possibly *Miniopterus schreibersii*, but this identification must be regarded as very provisional, and based on rather slender evidence.'

CRABS

Bristol Channel

m.v. *Cable Venture*. Captain J. Paterson. Cable operations on site. Observers: Captain D.E. Rickards. Mr P.S.D. Worrall, Chief Officer, Mr I.W.R. Gaitch, 2nd Officer and Mr D. Harnett, 3rd Officer.

30 October 1988. Whilst picking up some previously laid cable when carrying out cable operations, some crabs were found to be attached to that being brought on board. A photograph of one of them, taken by the Third Officer, is shown opposite page 176.

From information on board the ship, it was assumed that the crabs were Beaked Spider-crabs (*Macropodia rostrata*). Also noted attached to the same cable were starfish.

The depth of water at the time was 75 m and the surface temperature was 13.7 °C at 1200 GMT.

Position of ship: 51° 18'N, 05° 27'W.

Note. Dr F. Evans, of the Dove Marine Laboratory, University of Newcastle upon Tyne, comments:

'I attempted to key out this crab from the photograph, using the Field Studies Council's *Key to the Crabs and Crab-like Animals of British Inshore Waters* and got as far as the genus, which is indeed *Macropodia* (and not *Inachus*) but the species remains uncertain. It is, in fact, very likely *M. rostrata*, the Long-legged Spider Crab which, according to Ingle (*British Crabs*: British Museum, Natural History), does occur in the Bristol Channel. The most likely alternative, *M. tenuirostris*, the Slender Spider Crab, appears not to have been recorded from there although it is known from Plymouth and from the Irish Sea. CEGB marine biologists confirmed to me recently that their extensive sampling in the Bristol Channel had never revealed *M. tenuirostris* there. But the photograph, even with the help of magnification, was not quite able to provide the resolution necessary to distinguish the species with certainty.'

BIRDS

North Atlantic Ocean

m.v. *Forthbank*. Captain P. Simpson. Le Havre to Cristobal. Observers: Mr K.P. Mowat, 3rd Officer and ship's company.

6 October 1988. At 1200 GMT a bird of the petrel family was discovered on the boat deck. It appeared to be storm damaged, making no effort to move, hiding crouched up against the bulwark and offering very little resistance when being picked up. Its vital statistics were as follows: it was small, with a body length of 15–18 cm and wing-span of 33 cm; it had black upper parts and sooty-black under parts, but with a tiny line of white feathers at the base of the underside of the wings; the tail was square, and the bird had tiny legs with webbed feet.

The bird was placed in a cardboard box and kept in a safe, quiet cabin while efforts were made to scan through previous issues of *The Marine Observer* to find the passage on the 'Treatment of Bird Casualties at Sea' [July 1986, pp. 137–139]. Once the literature had been found and read, the bird was given water, which it drank. The following morning, it was found sitting in the shower and it was discovered that some of the cooked, cold turkey, which had been left with it overnight, had been eaten.

Having been watered, fed and rested the bird became far more active, and it was decided that it should be released. The petrel was taken down aft and gently launched over the side; it flew upwards, gaining great height, and remained with the vessel for a few minutes before disappearing from view. A second, identical bird was recovered from the deck a few hours before the first one was released, and this too was launched at the same time; however, it flew downwards and appeared to land on the water a short distance away from the vessel.

Position of ship: 38° 00'N, 31° 43'W.

Western South Atlantic

m.v. *Falklands Desire*. Captain G.J. Tully. F.I. Interim Conservation Zone. Observers: the Master, Mr I.M. Maden, Chief Officer and Mr C.D. Levesley, 2nd Officer.

11 October 1988. At 1232 GMT, whilst the vessel was on patrol about 24 n.mile south-west of Cape Meredith, a small bird, similar to a wren in size and shape, landed on the skylight on deck aft of the bridge. It was obviously out of its normal environment and its feathers were all fluffed out; however, it did not appear unduly exhausted. From the skylight, it flew to the D.O.T. boat where it walked about in a quick, hopping fashion, before fluttering off with a quick, beating flight, in a south-easterly direction.

The duration of its visit was only about two minutes, but nevertheless, a good impression of its characteristics was gained. It was very dark brown or black with a distinctive reddish-brown 'shawl' across its back, its needle-sharp beak together with the quite long, delicate legs were all black. After much discussion, the bird was finally identified from the *Guide to the birds of the Falkland Islands* as a male Rufous-backed Negrito, common in Tierra del Fuego, but last recorded as a lone sighting in the Falkland Islands in September 1963.

Prevailing winds during the previous few days had been strong NW'ly, reducing to a light breeze. The weather had been generally bright and clear by day but with extensive fog patches over the previous two nights. Weather conditions at the time of the sighting were: dry-bulb temperature 6.4 °C, pressure 1014.6 mb, wind NNW'ly, force 4.

Position of ship: 52° 20′S, 61° 21′W.

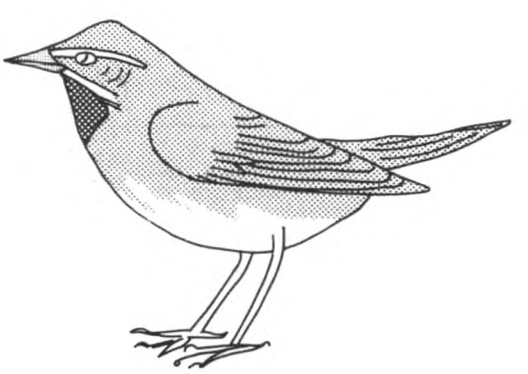
Note. Commander M.B. Casement, former Chairman of the Royal Naval Birdwatching Society, has retained a copy of this unusual sighting for further investigation.

East China Sea

m.v. *Rimula*. Captain J.L. Taylor. Pohang to Cape Lambert. Observers: the Master, Mr M.K. Jelfs, 3rd Officer and Mr D.J.M. Wilson, Catering Officer.

28 October 1988. At 1330 GMT a small bird was sighted on deck by the Third Officer. On closer examination through binoculars, the bird proved to be a Siberian Rubythroat (*Erithacus calliope*) as identified from *A Field Guide to the Birds of Japan*, by Shinji Takano. The most striking feature of this bird was the bright-red throat patch which was clearly noticeable from some distance without the aid of binoculars.

The white eyebrow and moustachial stripes were clearly seen which, with the brownish colouring of the back and head, grey/brown breast and flanks, and pale-coloured belly, together with the red throat, confirmed the identification of this bird. (See sketch.)



It was observed over a period of about half an hour, during which time it was noted to move in short, rapid runs across the deck. It is assumed that this particular bird was in the process of migrating from its normal breeding area in the eastern Soviet Union towards Malaya and Indo-China.

Weather at the time of the sighting was: dry bulb 24 °C, pressure 1016.5 mb, wind NNE'ly, force 5, the sky was overcast and there was slight haze.

Position of ship: 27° 11′N, 126° 32′E.

Note. Commander M.B. Casement is most appreciative of Captain Taylor's detailed identification of *Erithacus calliope*, and this report, as well as other ships' items on birds, is likely to receive mention in *Sea Swallow*, the RNBWS news-sheet. Merchant Navy Officers are invited to join the Society, whose honorary Secretary can be contacted at 19 Downlands Way, South Wonston, Winchester, Hants SO21 3HS.

INSECTS

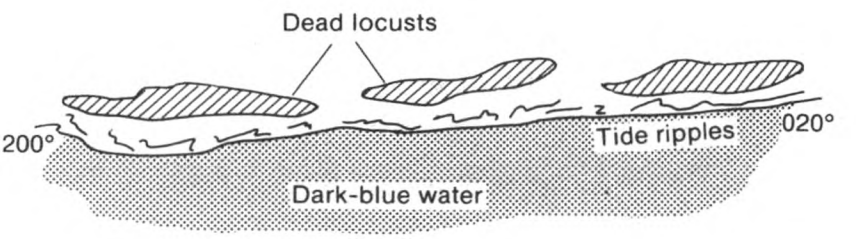
Equatorial Atlantic

m.v. *Entalina*. Captain D. Conway. Madras to Corpus Christi. Observers: the Master, Mr N.J. Walker, 3rd Officer and Mr D.H. Parkes, Radio Officer.

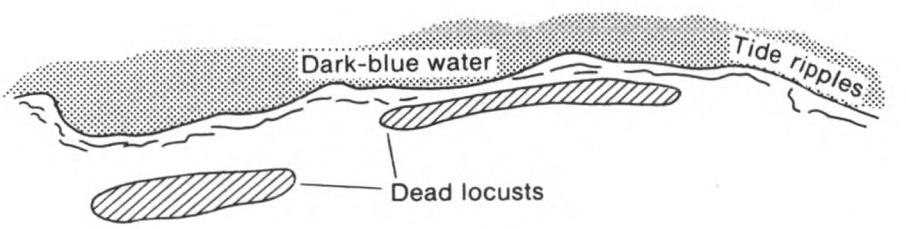
4–5 November 1988. At 1200 GMT whilst off the north-east coast of Brazil, a single, pink locust was observed on the starboard bridge wing. On attempting to catch this one, approximately 30 more were seen scattered around the bridge deck. Throughout the 4th more and more appeared, and by nightfall an estimated 100 locusts were distributed around the ship. None of them seemed willing to leave, and the ones that did attempt to fly only travelled a maximum of about 20 m. The wind had previously been moderate NE'ly, force 4 so it was assumed that the locusts had come from Africa.

During the night more locusts arrived and the next day the ship seemed to be covered with them. Throughout the morning, small groups of flying locusts arrived from ahead, the ship's course at this time was 298° and the wind was E'ly, force 3. At 1230 on the 5th apparent tide ripples were noted in a line bearing 210° to 020°, with the colour of the water on the other side of them changing to a darker shade, but no change in the sea temperature was noted.

Strangely, also seen were large amounts of dead locusts in the water on the far side of the ripples, covering areas of water about 5–10 m wide and stretching along the line. A marked change in the current was observed through a satellite fix, giving a shift to 009° at 2 knots from 300°. The sketch shows the effect seen at 1230 and at 1445 when the vessel passed another, similar, tide ripple with associated dead locusts and water colour changing back to dark blue.



1230 GMT



1445 GMT

Weather conditions on the 4th were air temperature 30.0 °C, wet bulb 27.0, wind SE'ly, force 2. On the 5th, the air temperature was 27.5, wet bulb 26.5, wind E'ly, force 3.

Position of ship on the 4th: 04° 34′N, 47° 17′W.

Position of ship on the 5th: 07° 57′N, 53° 20′W.

Red Sea

m.v. *Isocardia*. Captain J.P. Bateman. Ruwais to Lavera. Observers: the Master, Mr R. Orange, 3rd Officer, and ship's company.

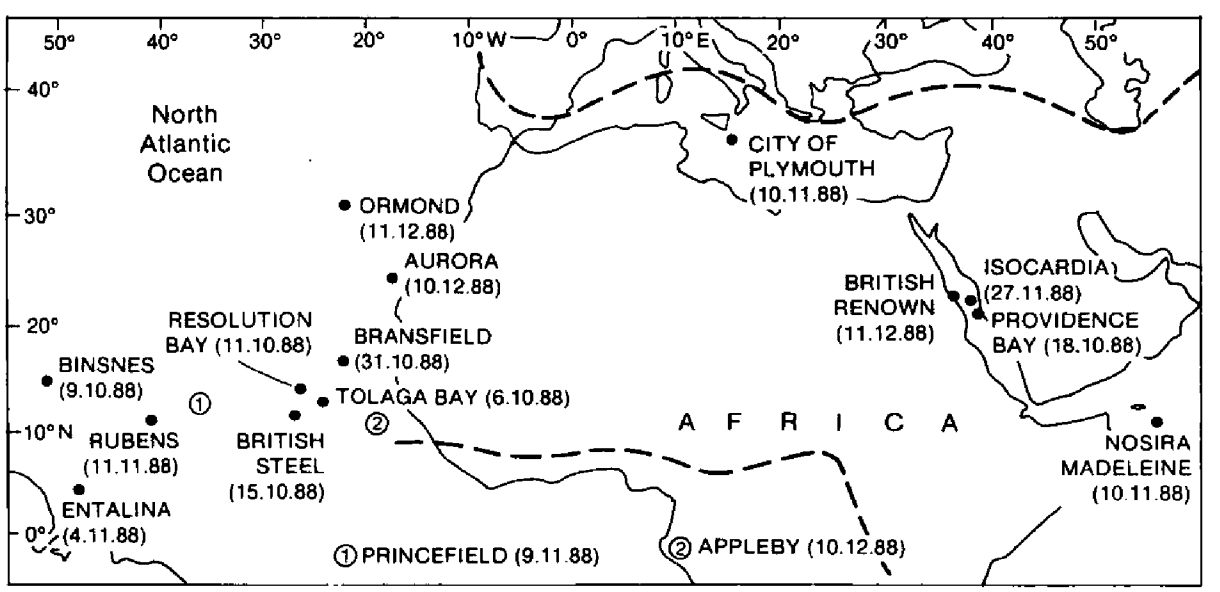
27 November 1988. During the late afternoon when the vessel was northbound and centrally placed between Sudan and Saudi Arabia east of Jaz el Dibia, isolated pink locusts of between 5 cm and 7 cm long were spotted on the aft decks. These locusts built up in number throughout the rest of the day to approximately 50 in total. In the night, these were joined by several yellow locusts of similar length to the pink ones; the photograph opposite page 176 shows one of each type. Over the next day or two, the locusts either left the ship or died on board.

Weather conditions at the time were: air temperature 27.0 °C, falling to 24, pressure 1016 mb, steady, wind SE'ly, force 2, backing to NW'ly, force 5.

Position of ship: 22° 00'N, 37° 48'E.

Note. Numerous reports of locusts at sea have been received for the period of October to December 1988; the map shows the location of those ships whose reports have been received to date.

An article about locusts and the current plague of these insects appears on page 190 of this issue.



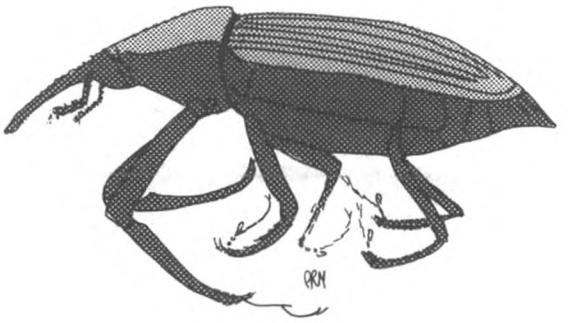
KEY: — — — invasion area of the desert locust during 1986 to 1988. (After Pedgley.)

South China Sea

m.v. *Cardigan Bay*. Captain J.H. Hutson. Hong Kong to Singapore. Observers: the Master, Mr D.J. Baily, 1st Officer, Mr S.N. Horne, 2nd Officer, Mr C.R. Merry, 3rd Officer and Mr J. Bastable, SM.

13 October 1988. Whilst proceeding towards Singapore from the eastern approaches, a very impressive beast, see sketch, was found lying on his back on the port bridge wing. Owing to his somewhat aggressive appearance, the large insect was carefully captured.

It measured approximately 77 mm in overall length and had a breadth of 21 mm; the underbody, legs and 'trunk' were black, whereas the top of the head and wings were a dull, reddish-brown. Longitudinal striations were also observed on its wing cases.



The Pilot, who boarded later, thought that the creature was an Elephant Beetle, but was not absolutely sure; certainly, the trunk-like object on its head would lend credence to this identification.

Position of ship: approximately 01° 21′N, 104° 22′E.

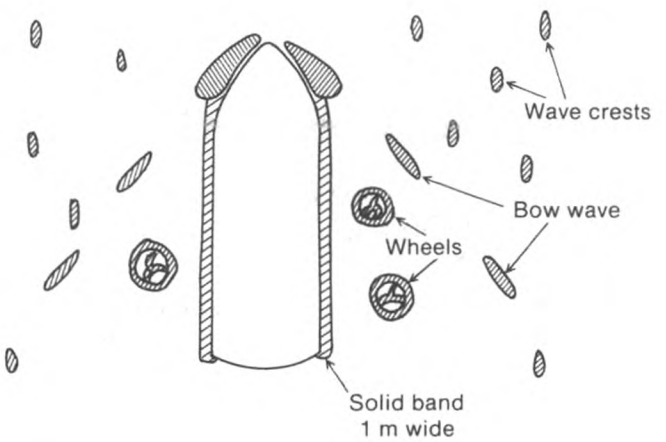
BIOLUMINESCENCE

Gulf of Aden

m.v. *City of Edinburgh*. Captain J.I. Brown. Port Kelang to Jeddah. Observers: Mr A.R. Rendle, Chief Officer and Mr N. Walker, 3rd Officer.

13 December 1988. Between 2250 and 2310 GMT bioluminescence was observed around the bow of the vessel, coinciding with the bow wave. A 'solid' band of 1 metre in thickness was also noted along the length of the ship from bow to stern, and appeared to be below the surface of the water. The phenomenon was also observed where the wave crests broke, which was quite frequently, the wind being NE×N'ly, force 5 at the time. The bioluminescence also extended slightly abaft each beam, again where the vessel's bow wave passed; it was a pale green in colour, equal in brilliance to a first magnitude star.

For five minutes between 2330 and 2335, bioluminescence was again observed but with two additional types of display, see sketch. Firstly, two diffuse white clouds like 'milky seas' were seen approximately 100 m from the vessel. They



were about 300 m long by 100 m wide and were parallel to the ship's course of 273°. The second type was in the form of rotating wheels, of which six were seen separately, and consisted of a luminous 'ring' approximately 0.5 m wide, with

three 'spokes', the diameter of the whole being 3 m. There was no visible hub but the wheels rotated in a clockwise direction, and their centres were, on each occasion, 10 m from the ship's side. Their duration was about 10 seconds before fading.

Weather conditions at the time were: air temperature 25.2 °C, wet bulb 21.0, sea 24.0, pressure 1015.2 mb, cloud cover 4 oktas.

Position of ship: 12° 06'N, 50° 52'E.

Note. Dr P.J. Herring, of the Institute of Oceanographic Sciences, comments:

'The commonest cause of bow-wave and wave-crest luminescence as described are dinoflagellates, but the spoked wheels are most remarkable. Almost all the observations of luminous wheels (including those from the Gulf of Aden area) are of very large phenomena, often extending to the horizon (see Phosphorescent wheels: fact or fiction? *The Marine Observer*, October 1985, pp. 194–201). Small wheels are very rarely reported. They are very difficult to interpret; one explanation might be that they result from the turbulence eddies thrown off by the vessel's passage, but this does not explain either the 'spokes' or the fact that all were rotating clockwise. I would have expected different directions of rotation on each side of the vessel. I confess to being baffled.'

Indian Ocean

m.v. *Tolaga Bay*. Captain R.P. Royan. Port Kelang to Jeddah. Observers: Mr C.K. Urwin, 2nd Officer and Mr D. Posner, SM.

30 November 1988. At approximately 1700 GMT the ship's wake, in the vicinity of the accommodation, showed splashes in the water as if the ship was moving through a shoal of fish. When an Aldis lamp was shone on to the sea surface, it could be seen that the 'splash' effect had been an optical illusion and the ship was actually passing through an area of bioluminescence. The effect of the lamp was to leave the sea luminous.

The bioluminescence took two forms. Firstly, as the Aldis lamp was shone on to the surface, bright-orange flashes, as from flickering flames were seen. The second form occurred after the lamp was switched off, when the flashes were replaced by very strong spots of luminous, green light. Both of these effects were seen against a uniform backdrop of a pale, luminous green. This effect was observed to be continuous for as far as could be reached with the beam of the Aldis lamp, suggesting that the phenomenon was uniform throughout the area. On several occasions, initials were 'written' on the water using the lamp, and they could be seen clearly after the light was switched off, thus giving an idea of the strength of the bioluminescence.

The *Tolaga Bay* is a container ship of 52,055 grt and was on a course of 281° at a speed of 22.0 knots.

Position of ship: 08° 16'N, 73° 02'E.

Note. Dr P.J. Herring comments:

'This is another interesting report of light-stimulated luminescence in the Indian Ocean. The general, greenish glow would have been caused by ostracod crustaceans, but the orange flashes were probably reflections from the eyes of lantern fishes which feed enthusiastically on ostracods. The extent of the light response gives a good indication of the widespread nature of these ostracod swarms, which are common off Arabia and the western margin of India.'

DISCOLOURED WATER

Gulf of Aden

s.s. *British Renown*. Captain M. Searle. Suez to Sirri Island. Observers: Mr K. Patterson, 2nd Officer and Mr C. Donoso, 3rd Officer.

15 December 1988. At about 1200 GMT the vessel passed through areas of water which were heavily discoloured. The discolouration was reddish-orange and took the form of patches which were about 2–3 n.mile long and which fanned out in long, dense streaks, passing close by the ship's side. The streaks were at the surface or just below it. See photograph opposite page 193.

The ship's course and speed was 072°, 12 knots and the wind was ENE'ly, force 3.

Position of ship: 13° 24'N, 49° 00'E.

Note. Dr F. Evans comments:

'The magnificent photograph shows a beautiful display of Langmuir circulation driving the dinoflagellate bloom, or red tide, into windrows. The way that it works is that when the wind drives the surface water along, it at the same time causes it to rotate in great, horizontal cylinders whose axes are directed downwind while the rotating direction is across the wind. Each cylinder of water rolls in the opposite direction to its neighbours, like a train of cog-wheels. The dinoflagellate plant cells are thus in a water system which revolves from surface to depth and back to the surface.

'But if the plant cells are buoyant, while they will move easily across the surface, they will not readily submerge. So they aggregate at the downwelling interface between two cylinders. And that is just what the picture shows, lines of plant plankton accumulated in the windrows. A good account of red tides and their poisonous effects on marine life is given in Paul Horsman's *Seafarer's Guide to Marine Life* (Croom Helm).

'Langmuir circulation occurs at high as well as low wind speeds; it is often manifested as slicks, but these become obscured by waves in stronger winds.'

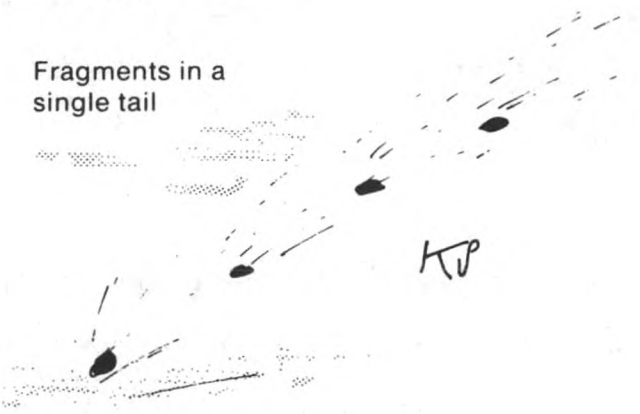
METEORITES

Eastern North Atlantic

s.s. *British Renown*. Captain B. Wardman. Sirri Island to Rotterdam. Observers: Mr K. Patterson, 2nd Officer and Mr H. Esmao, AB.

9 November 1988. At 2330 GMT a large, brilliant-white fireball and associated breaking fragments were observed passing close by to starboard.

The meteor/fireball was seen initially at an altitude of approximately 45°, bearing 4 points to starboard, and finally burnt out at an altitude of 10°, bearing 2 points to starboard; it was not seen to strike the surface of the sea. The sketch gives an indication of its appearance.



Throughout the observed descent, small fragments of material were left in its path, burning for about 2 seconds, and produced an illuminated tail. However, at no time did these fragments form anything but a single tail. The whole observation lasted for about 5 seconds, the brightness of the fireball being like the white light of a burning magnesium ribbon. This light was in no way painful on the eye although its intensity did leave an after-image for a few seconds. Behind the main object and remaining in its path, faint, yellow/orange colours were observed as if it was going through a stage of finally burning up in the atmosphere.

At the time of observation the sky was covered by only 1 okta of small cumulus.

Position of ship: 19° 30′N, 19° 05′W.

Note. Mr H. Miles, Director of the Artificial Satellite Section of the British Astronomical Association, comments:

'This was without doubt a brilliant fireball, and the report gives an excellent visual description of the behaviour of the object as it burned up in the atmosphere. From the sketch of its track, it is possible that the fireball was a member of the Taurid meteor stream.'

Indian Ocean

m.v. *British Reliance*. Captain P.A. Darlow. Juaymah to Galveston. Observers: Mr I.C. Massey, Chief Officer and Mr E. Bernas, SM.

5 November 1988. In the early hours, many and frequent meteors could be seen all around the sky, but with no obvious fixed pattern. At 0100 GMT, two very bright meteors were observed at low altitude, and immediately after this, one bright meteor appeared to vanish into a small cloud, the effect being similar to a bright lightning flash within a cloud. The brightness of these three objects and their tails exceeded that of Venus and the moon, both of which were visible at this time; in fact, the air was so clear that Venus and Sirius had been observed rising.

At 0125, with frequent meteor activity continuing, another exceedingly bright flash was observed bearing 130° from the ship. This one also seemed to enter cloud (now increased to 1 okta small cumulus) and left a tail with a very prominent blue-green colour edged with red. Again, the lightning flash effect was noted and was bright enough to light up part of the ship.

The cloud base was estimated at 1,000–2,000 feet, and its distance as judged in the previous met. observation was 8–10 n.mile. This would indicate the meteor finally burning out at a very low altitude, or appearing to do so, as observed. A high level of meteor activity had been noted by other observers during the night, but not of the brightness described above.

The fact that the date was November 5th was pure coincidence! Weather conditions at the time were: dry bulb 26.8 °C, pressure 1012.0 mb, wind NE×N'ly, force 2.

Position of ship: 00° 53′S, 48° 32′E.

Note. Mr H. Miles comments:

'This is a good account of the Taurid meteors, so called because when their trajectories are produced backwards, they seem to radiate from a point in the constellation of Taurus; this point is called the radiant. They can normally be seen from about 20 October until 30 November, but activity

peaks around 3 November. Observers from the Meteor Section of the British Astronomical Association have also reported high activity for 1988, including many bright meteors. This report has been forwarded for inclusion in their records.'

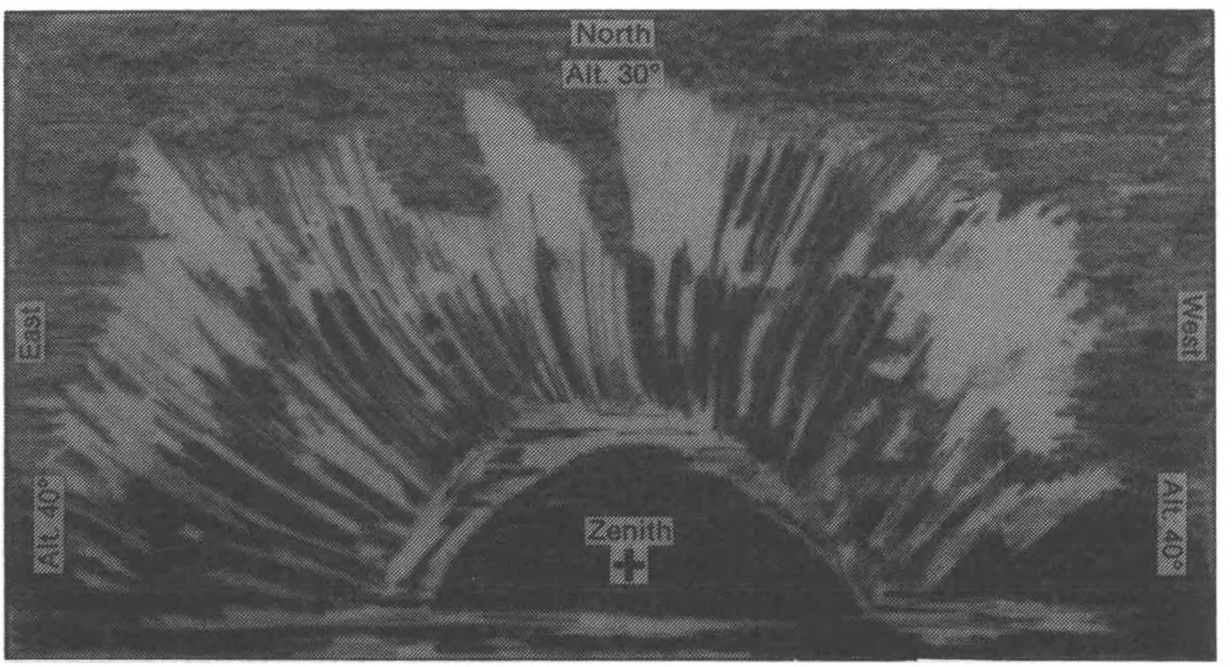
AURORA BOREALIS

North Sea

f.p.v. *Vigilant*. Captain D.L. Rattray. Fisheries patrol duties north of Scotland. Observers: the Master and Mr R.J. Sheldon, 2nd Officer.

10/11 October 1988. Once the glow of sunset had disappeared at 1910 GMT, various auroral patches appeared which then spread into homogeneous arcs. One such arc passed to the north of the vessel and one passed to the south; these stretched from horizon to horizon between 250° and 100°. Numerous 'searchlight' effect rays then formed, bearing 260°.

From 1920 to 1940 a spectacular display of rayed bands and rayed arcs was seen, varying in degrees of intensity from a dull glow to a bright light tinged with green. After 1940, and until 2110, the frequency of the rayed bands and arcs



decreased and they became less intense. The sketch shows what happened at 2110 when the homogeneous arcs disappeared and activity intensified from the zenith down to 40° above the horizon in an arc from 270° to 090°.

Position of ship: 61° 00'N, 04° 00'W.

AURORA AUSTRALIS

South Pacific Ocean

m.v. *Remuera Bay*. Captain R.J. Bland. Port Chalmers to Zeebrugge. Observers: the Master, Mr K.P. Ireland, 2nd Officer and Mr K. Kunold, AB.

10 October 1988. Whilst the vessel was on a great circle track from Port Chalmers to Cape Horn, an auroral display was observed commencing at 0800 GMT to the south of the vessel's position. The cloud cover at the time was seven oktas, with cumulus and altocumulus predominating. Initial sightings showed a

display of moderate brightness, taking the form of a glow reaching an altitude of approximately 20° to 30° above the horizon, and which spanned the horizon in an arc bearing 150° to 220° from the vessel. At this stage, the aurora appeared pale in colour although it was viewed through breaks in the cloud cover and over the cloud tops. Later, at 1030, the clouds had partially dissolved revealing bright rays bearing 230° to 250° at an altitude of 50° above the horizon and above a cumulus cloud base. The rays were pink/red in colour and remained visible for a period of 10 minutes.

Cloud then formed again, obscuring the main aurora, and towards 1200, all that remained visible was a bright glow extending from 125° to 250°, reaching an altitude of 40° to 50°, with occasional rays in bundles again appearing above moderate cumulus.

The phenomenon would almost certainly have been spectacular in a clear night sky; the aurora had previously been observed as a barely discernible glow on the southern horizon whilst the vessel was passing Christchurch on 6 October.

Position of ship at 0800 GMT: 52° 37'S, 168° 43'W.

UNIDENTIFIED LIGHT

Equatorial Atlantic

m.v. *British Success*. Captain T.A. Wood. Dumai to South Sabine Point. Observer: the Master, Mrs S.J. Davies, 3rd Officer, Mr C. Davies, Supernumerary and Mr P. Coffer, S3.

3 October 1988. At 2340 GMT a large circle of what appeared to be reflected light was seen against the constellation of Sagittarius, at an elevation of 35°. The shape moved from the port bow, across the vessel to the starboard side, gaining in elevation. This movement did not correspond with the direction of the wind.

The shape was perfectly circular, and like a halo in appearance, but with nothing in the middle (no luminary). It seemed to glow somewhat at first, and was a dull, yellowish colour; it was also transparent inasmuch as the stars could be seen behind it throughout, and did not appear to be composed of any solid objects.

The whole shape was the size, relatively, of a small cumulus cloud, and was estimated not to exceed approximately 1 n.mile in diameter, with the width of the 'halo' being about one-third of the diameter. The altitude of the phenomenon was estimated at 2,000 feet.

It was clearly visible for approximately ten minutes. At one point on the starboard bow it began to fade and fill in, becoming gradually less distinct before becoming indiscernible. No magnetic or radar anomalies were detected. The ship's course was 298°.

Weather conditions at the time were: air temperature 27 °C, wet bulb 25.0, pressure 1011.6 mb, wind SE'ly, force 3–4; a few small cumulus clouds were also present.

Position of ship: 03° 25'N, 43° 51'W.

551.586:591.54

Weather and the current locust plague*

By D.E. Pedgley
(Overseas Development Natural Resources Institute, Chatham)

Twenty years ago, a colleague and I gave an account of the spectacular increase in numbers of the desert locust, *Schistocerca gregaria*, during 1967 and 1968 (Pedgley and Symmons 1968). That upsurge came to an end in the following year, and apart from a similar short-lived upsurge in the late 1970s there has been no subsequent significant threat in any of the 60 or so countries in Africa and Asia that can be invaded (Figure 1). In the past three years, however, that calm situation has changed completely, for many of those countries have been invaded and the others are under threat in 1989. How the weather has helped to bring about this situation is the subject of this article.

The following description of events is necessarily brief, being based very largely on the daily *European Meteorological Bulletin* published by the Deutscher Wetterdienst and on the locust situation summaries published by the Food and Agriculture Organization of the United Nations, whose Emergency Centre for Locust Operations, in Rome, has the task of collating reports and issuing forecasts. The description will no doubt need to be modified when a detailed analysis has been made of the huge numbers of records that have accumulated. Nevertheless, the developments are clear enough to show the effects of weather on them.

To understand the events, we need to recall how heavily the desert locust relies on the weather to survive in its harsh environment. For an outline, see Pedgley and Symmons (1968); and for more detail, see Pedgley (1981). Here, it will be enough to bear in mind the following salient points:

1. In warm weather the life cycle is about two months.
2. Eggs hatch successfully only if they have been laid in soil wetted by either heavy rain (more than about 20 mm) or run-off.
3. Young, flightless locusts (hoppers) develop at a rate increasing with the temperature: minimum development time is about a month. The last moult gives them their wings.
4. Flight begins after about another week, and can be maintained when air temperatures exceed about 15°C in sunny weather.
5. Swarms are wind borne, at some variable fraction of the wind speed, and daily displacements can be several hundred kilometres.
6. Swarms generally fly by day and roost at night.
7. Swarms can fly for many days in succession, and even weeks, mostly before they start to lay their eggs.

With this background we can begin to consider the development of the current plague.

* Reproduced from *Weather*, April 1989, Vol. 44, No. 4 by kind permission of the Editor.

In 1985 there were locally good monsoon rains in countries just south of the Sahara and in the south-western Arabian peninsula. Although a few locusts were caught in Chad, Niger, Mali and Mauritania (Figure 1) it seems likely that there was under-reporting, for breeding by a substantial population would have been needed to produce even the few small swarms found during November in Mauritania. These swarms soon dispersed, and the start of the plague can be traced back to a different region — around the Red Sea.

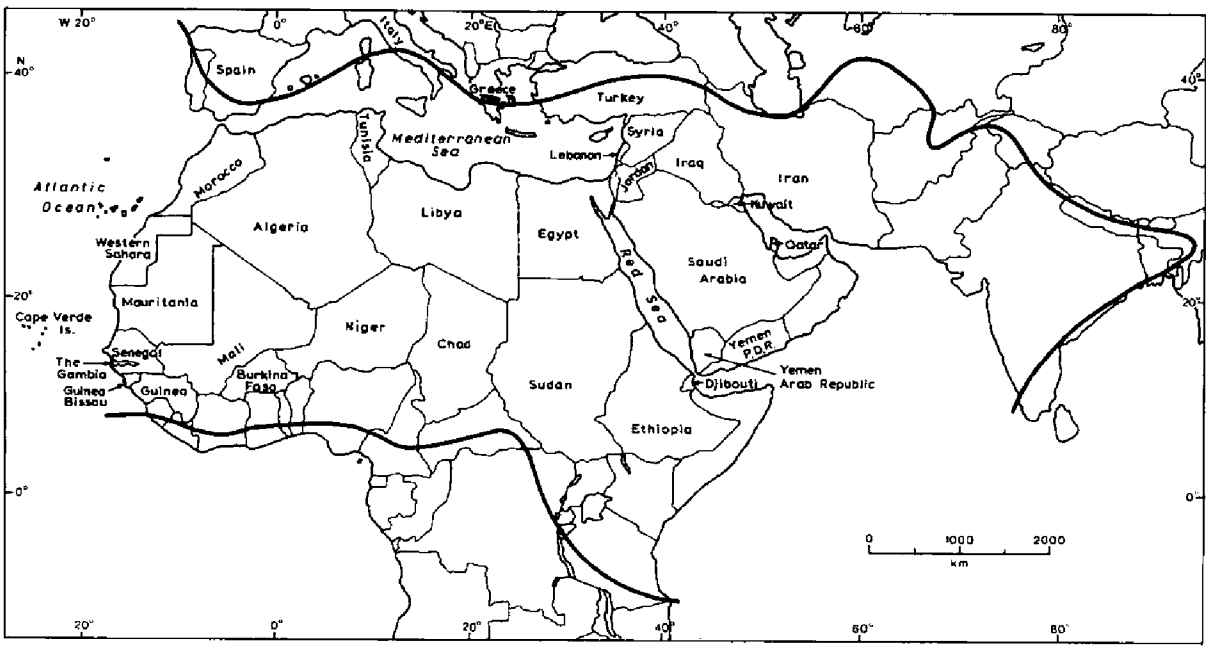


Figure 1. Invasion area of the desert locust *Schistocerca gregaria*, and countries invaded during the three years 1986 to 1988.

Good winter–spring rains from November 1985 to April 1986 on both sides of the Red Sea led to gregarious breeding from December in coastal areas of south-eastern Egypt, Sudan, Ethiopia and Saudi Arabia. By January 1986, swarms had started to appear. With gregarious breeding continuing into April, the resulting swarms spread by June, on the north-east winds characteristic of that time of year, to northern Ethiopia and central Sudan, and others reached the Yemen Arab Republic.

As a result of good monsoon rains in 1986 there was widespread breeding south of the Sahara from Mauritania to Ethiopia, and by October the situation had become potentially more threatening than at any time since 1978. Swarms that had moved into central Sudan posed the greatest threat, for breeding continued exceptionally late (into December) and produced numerous second- and possibly third-generation swarms. Thus, after only one year, a plague was threatening.

New swarms from Sudan moved north-east to coastal areas of the Red Sea, once again from south-eastern Egypt to Ethiopia, and on to Saudi Arabia, having crossed the Red Sea first in mid-November on a brief spell of south-west winds. Subsequently there were good winter rains, and widespread gregarious breeding continued into March 1987. The resulting swarms first spread south-west in May to central Sudan and the northern highlands of Ethiopia, and some locusts reached as far west as Chad and possibly Niger by June. This movement, on the north-east winds, was similar to that in 1986, but on a larger scale, more extensive and somewhat earlier.

Following heavy rains in late May and early June there was widespread and unusually early breeding, especially in central Sudan and northern Ethiopia, but less so in Chad and Niger. By August, new swarms were beginning to lay eggs and produce a second monsoon generation in countries from Niger to Ethiopia, so that by mid-October a great many swarms began streaming west and north-west to invade Mali, Mauritania, Western Sahara, Morocco and Algeria in the next few weeks. Some locusts also reached Spain, Tunisia and Libya. By December the largest populations were in northern Mauritania, Western Sahara and neighbouring parts of Morocco and Algeria, having reached those countries on brief spells of warm south-east winds ahead of eastward-moving cold fronts.

There had been good late monsoon rains over Mauritania in September, so once the swarms had arrived they began to breed, and gregarious breeding became unprecedentedly widespread as further good rains fell over north-west Africa in November and December. At this time further east, in Sudan, some swarms moved north-east to the Red Sea coast, as had happened in the previous two years, but few locusts seem to have crossed to Saudi Arabia, and breeding was not extensive.

During February 1988, numerous swarms developed from the breeding over north-west Africa and they moved north and north-east during the following month, on spells of warm, south-west winds typical of the winter, across Morocco and northern Algeria into Tunisia and Libya. Some locusts reached Italy at the end of the month; others later reached Greece; and swarms moved on the more frequent north-east winds across Mauritania to the Cape Verde Islands.

With further widespread and abundant rains, swarms matured rapidly and breeding resumed over an even wider area of north-west Africa. The subsequent spread of their progeny was impressive. By April, swarms had reached Egypt and north-western Saudi Arabia, although the latter country may have been infested from local breeding. At the same time, swarms spread south and south-east to Senegal, Gambia, Mali, Niger, Chad and western Sudan. By May they had also reached Guinea and Burkina Faso. In the wake of a cold front crossing north-east Africa on 25 and 26 May a wide area was invaded again, from Niger to Jordan. The invaded area had by then expanded to cover almost all countries in Africa known to have been infested in previous plagues, and reached new limits in southern Europe. The main exception was East Africa, from Somalia southwards, perhaps because the Sudan sources had not produced swarms at a time to catch the onset of the north-east trade winds there in October and November of 1987.

An eastward spread of swarms continued into July 1988, when it extended across central Sudan and northern Ethiopia, and across the Red Sea into the Yemen Republic. Good monsoon rains in all the countries invaded (highlighted by the widely-reported torrential falls in Khartoum on 5 August and subsequent flooding) led to very widespread breeding; again there was a second generation, and a third in some countries. Migration of new swarms became widespread from mid-September. Although some reached Morocco and Algeria, the direction of movement was more to the west than north-west. Indeed, from numerous ship reports and further invasion of the Cape Verde Islands, it is clear that very large numbers of locusts were blown out to sea on several occasions, some being taken to the Caribbean and adjacent parts of South America in mid-October (Ritchie and Pedgley, 1989), and even as far as Cuba and Jamaica. On 26 October, a short spell of warm south-west winds brought locusts from north-west Africa to south-west England, the first record from there since 1954.

Opposite page 192.

The Director-General presents Long-service Awards to (Above) Captain D.V. Newlin, Retd and (Below) Commodore T.D. Ridley. (See page 199.)

Opposite page 193.

Photo. by K. Patterson

'Red tide' in windrows as seen from s.s. *British Renown.* (See page 186.)

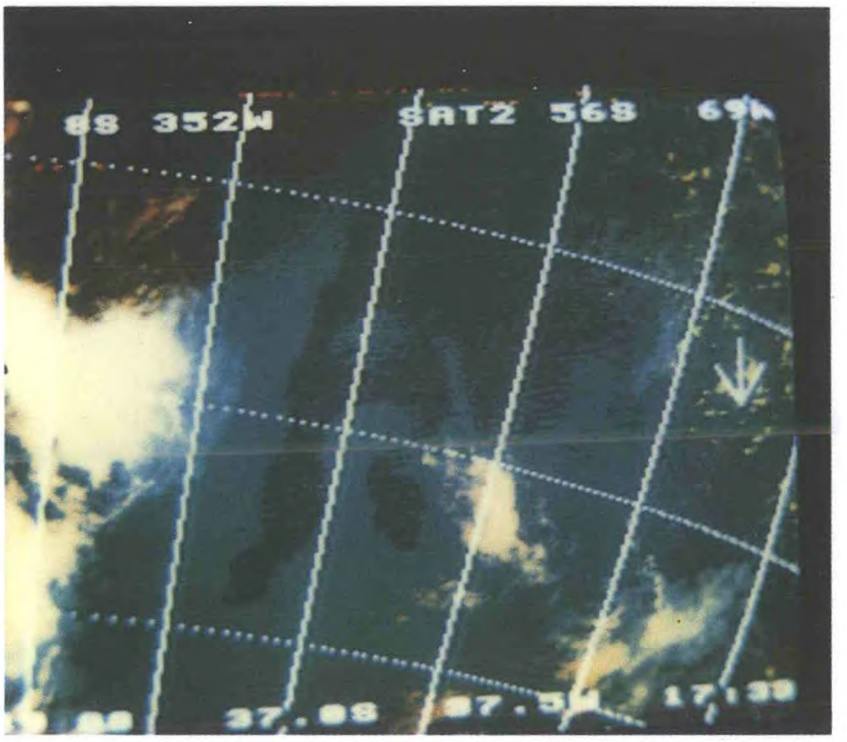


Photo. supplied by C.J. Poole-Gleed

15 November 1988 at 1733 GMT

NOAA-11 satellite view of the Falkland current/Brazil current confluence, as received on board R.R.S. *Bransfield*, with the lighter and darker shades of blue indicating the two currents respectively. The Mar del Plata is at top left. (See page 177.)

It is not known what proportion of the monsoon production perished at sea.

Formation of monsoon swarms ended in November but invasions continued in the west, reaching Guinea, Guinea Bissau and the Gambia. At the same time further east, swarms from the Sudan took their seasonal migration to the Red Sea coast, reaching as far as Djibouti. Some crossed the sea to Saudi Arabia, to reach Iraq and Kuwait by October, Iran by November, and Jordan, Qatar, Yemen Arab Republic and PDR Yemen by December. Widespread breeding started around the Red Sea and in north-western Saudi Arabia. In the north, an extensive movement on south-west winds at the end of November took swarms across south-eastern Algeria and Libya to northern Egypt, and some locusts reached Lebanon, Syria and Turkey.

It is clear that the plague build-up can be attributed to the chance occurrence of a sequence of good rains following each seasonal windborne migration. Such a sequence has been noted at the start of other plague upsurges (Waloff 1966). The remarkable size of the current plague, however, starting from the first small swarms in November 1985 and expanding to more than twenty countries being invaded in the following three years, is almost certainly due to the persistence of some of the rainy seasons. In all but probably one season, the rains allowed the development of at least two generations, each likely to have given rise to an order of magnitude increase in locust numbers. Over the three years, the total increase may well have been about ten orders of magnitude.

Why was this plague not controlled before it became so severe? The answer is that the means for control, although well known, were not available. Despite large emergency control campaigns costing over $100 million, supported by many donor countries and international agencies outside the locust invasion area, the plague grew. Why this should have continued needs careful assessment but it seems likely to have been due to a combination of events, including: a shortage of trained personnel; locusts breeding in areas made inaccessible by weather or wars (highlighted by the loss of five lives on 8 December 1988 when a locust control aircraft, flying from Senegal to Morocco, was shot down over Mauritania by a ground-to-air missile); use of non-persistent pesticides, making it difficult to treat, in time, all of those infestations that were accessible; and rapid breeding following treatment. How these events came about is beyond the scope of this article but both the prolonged running-down of the national and regional locust control services in the absence of any significant threat over many years (leading to a reduced ability to alert the international community), and the banning in many countries, on environmental grounds, of the most effective insecticide for hopper control (dieldrin), have played their part.

In summary, the weather has been exceptionally favourable to the desert locust for three years so far, and locust numbers have not been kept down. As for the future, the plague is likely to continue for several years if the weather remains favourable or control measures continue to be inefficient.

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The global greenhouse effect

Between 27 and 30 June 1988 a major World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) conference, initiated and hosted by Environment Canada, was held in Toronto, with the theme *The Changing Atmosphere: Implications for Global Security*. More than 350 experts from over 40 countries, including Dr J.T. Houghton, Director-General of the Meteorological Office, gathered at Toronto to attend 'the conference that was waiting to happen', to address the global threat to the Earth's atmosphere.

The WMO document containing the Conference Proceedings reached the Met. Office in June of this year, and the contents are of such significance that we reproduce below some excerpts from the Conference Statement.

Summary

... Humanity is conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war. The Earth's atmosphere is being changed at an unprecedented rate by pollutants resulting from human activities, inefficient and wasteful fossil fuel use and the effects of rapid population growth in many regions. These changes represent a major threat to international security and are already having harmful consequences over many parts of the globe.

Far-reaching impacts will be caused by global warming and sea-level rise, which are becoming increasingly evident as a result of continued growth in atmospheric concentrations of carbon dioxide and other greenhouse gases. Other major impacts are occurring from ozone-layer depletion resulting in increased damage from ultra-violet radiation. The best predictions available indicate potentially severe economic and social dislocation for present and future generations, which will worsen international tensions and increase risk of conflicts among and within nations. It is imperative to act now.

These were the major conclusions of the World Conference on The Changing Atmosphere: Implications for Global Security, held in Toronto, Ontario, Canada June 27–30, 1988. More than 300 scientists and policy makers from 46 countries, United Nations organizations, other international bodies and non-governmental organizations participated in the sessions.

The Conference called upon governments, the United Nations and its specialized agencies, industry, educational institutions, non-governmental organizations and individuals to take specific actions to reduce the impending crisis caused by pollution of the atmosphere. No country can tackle this problem in isolation. International co-operation in the management and monitoring of, and research on, this shared resource is essential.

The Conference called upon governments to work with urgency towards an *Action Plan for the Protection of the Atmosphere*. This should include an international framework convention, while encouraging other standard-setting agreements along the way, as well as national legislation to provide for protection of the global atmosphere. The Conference also called upon governments to establish a *World Atmosphere Fund* financed in part by a levy on the fossil fuel consumption of industrialized countries to mobilize a substantial part of the resources needed for these measures.

The issue

Continuing alteration of the global atmosphere threatens global security, the world economy, and the natural environment through:

(a) Climate warming, rising sea level, altered precipitation patterns and changed frequencies of climatic extremes induced by the 'heat trap' effect of greenhouse gases;
(b) Depletion of the ozone layer;
(c) Long-range transport of toxic chemicals and acidifying substances.

These changes will:

1. Imperil human health and well-being;
2. Diminish global food security, through increases in soil erosion and greater shifts and uncertainties in agricultural production, particularly for many vulnerable regions;
3. Change the distribution and seasonal availability of fresh water resources;
4. Increase political instability and the potential for international conflict;
5. Jeopardize prospects for sustainable development and reduction of poverty;
6. Accelerate the extinction of animal and plant species upon which human survival depends;
7. Alter yield, productivity and biological diversity of natural and managed ecosystems, particularly forests.

If rapid action is not taken now by the countries of the world, these problems will become progressively more serious, more difficult to reverse, and more costly to address.

Scientific basis for concern

The Conference calls for urgent work on an *Action Plan for Protection of the Atmosphere*. This Action Plan, complemented by national action, should address the problem of climate warming, ozone layer depletion, long-range transport of toxic chemicals and acidification.

Climate warming

1. There has been an observed increase of globally-averaged temperature of 0.5 °C in the past century which is consistent with theoretical greenhouse gas predictions. The accelerating increase in concentrations of greenhouse gases in the atmosphere, if continued, will probably result in a rise in the mean surface temperature of the Earth of 1.5 to 4.5 °C before the middle of the next century.
2. Marked regional variations in the amount of warming are expected. For example, at high latitudes the warming may be twice the global average. Also, the warming would be accompanied by changes in the amount and distribution of rainfall and in atmospheric and ocean circulation patterns. The natural variability of the atmosphere and climate will continue and be superimposed on the long-term trend, forced by human activities.
3. If current trends continue, the rates and magnitude of climate change in the next century may substantially exceed those experienced over the

last 5000 years. Such high rates of change would be sufficiently disruptive that no country is likely to benefit *in toto* from climate change.

4. The climate change will continue so long as the greenhouse gases accumulate in the atmosphere.
5. There can be a time lag of the order of decades between the emission of gases into the atmosphere and their full manifestation in atmospheric and biological consequences. Past emissions have already committed planet Earth to a significant warming.
6. Global warming will accelerate the present sea-level rise. This will probably be of the order of 30 cm but could possibly be as much as 1.5 m by the middle of the next century. This could inundate low-lying coastal lands and islands, and reduce coastal water supplies by increased salt-water intrusion. Many densely populated deltas and adjacent agricultural lands would be threatened. The frequency of tropical cyclones may increase and storm tracks may change with consequent devastating impacts on coastal areas and islands flooded by storm surges.
7. Deforestation and bad agricultural practices are contributing to desertification and are reducing the biological storage of carbon dioxide, thereby contributing to the increase of this most important greenhouse gas. Deforestation and poor agricultural practices are also contributing additional greenhouse gases such as nitrous oxide and methane.

Ozone-layer depletion

1. Increased levels of damaging ultra-violet radiation, while the stratospheric ozone shield thins, will cause a significant rise in the occurrence of skin cancer and eye damage, and will be harmful to many biological species. Each 1 per cent decline in ozone is expected to cause a 4 to 6 per cent increase in certain kinds of skin cancer. A particular concern is the possible combined effects on unmanaged ecosystems of both increased ultra-violet radiation and climate changes.
2. Over the last decade, a decline of 3 per cent in the ozone layer concentration has occurred at mid-latitudes in the Southern Hemisphere, possibly accompanying the appearance of the Antarctic ozone hole; there are indications that a smaller decline has occurred in the Northern Hemisphere. Changes of the ozone layer will also change the climate and circulation of the atmosphere.

Acidification

In improving the quality of the air in their cities, many industrialized countries unintentionally sent increasing amounts of pollution across national boundaries in Europe and North America, contributing to the acidification of distant environments. This was manifested by increasing damage to lakes, soils, plants, animals, forests and fisheries. Failure to control automobile pollution in some regions has seriously contributed to the problem. The principal damage agents are oxides of sulphur and nitrogen as well as volatile hydrocarbons. The resulting acids can also corrode buildings and metallic structures causing overall, billions of dollars of damage annually.

The various issues arising from pollution of Earth's atmosphere by a number of substances are often closely interrelated, both through chemistry and through

potential control strategies. For example, chlorofluorocarbons (CFCs) both destroy ozone and are greenhouse gases; conservation of fossil fuels would contribute to solving both acid rain and climate change problems.

A call for action

The Conference urges immediate action by governments, the United Nations and their specialized agencies, other international bodies, non-governmental organizations, industry, educational institutions and individuals to counter the ongoing degradation of the atmosphere.

An *Action Plan for the Protection of the Atmosphere* needs to be developed, which includes an international framework convention, encourages other standard-setting agreements and national legislation to provide for protection of the global atmosphere. This must be complemented by implementation of national action plans that address the problems posed by atmospheric change (climate warming, ozone-layer depletion, acidification and the long-range transport of toxic chemicals) at their roots.

The following actions are mostly designed to slow and eventually reverse deterioration of the atmosphere. There are also a number of strategies for adapting to changes that must be considered. These are dealt with primarily in the recommendations of the working groups.

Actions by governments and industry

(a) *Ratify the Montreal Protocol on Substances that Deplete the Ozone Layer.* The Protocol should be revised in 1990 to ensure nearly complete elimination of emissions of fully halogenated CFCs by the year 2000. Additional measures to limit other ozone-destroying halocarbons should be considered.

(b) *Set energy policies to reduce the emissions of* CO_2 and other trace gases, in order to reduce the risks of future global warming. Stabilizing the atmospheric concentrations of CO_2 is an imperative goal. It is currently estimated to require reductions of more than 50 per cent from present emission levels. Energy research and development budgets must be massively directed to energy options which would eliminate or greatly reduce CO_2 emissions and to studies undertaken to further refine the target reductions.

(c) *Reduce* CO_2 emissions by approximately 20 per cent of 1988 levels by the year 2005 as an initial global goal. Clearly, the industrialized nations have a responsibility to lead the way, both through their national energy policies and their bilateral and multilateral assistance arrangements. About one-half of this reduction would be sought from energy efficiency and other conservation measures. The other half should be effected by modifications in supplies.

(d) *Set targets for energy efficiency improvements* that are directly related to reductions in CO_2 and other greenhouse gases. A challenging target would be to achieve the 10 per cent energy efficiency improvements by the year 2005.

(e) *Negotiate now* on ways to achieve the above mentioned reductions.

(f) *Initiate management systems* in order to encourage, review and approve major new projects for energy efficiency.

(g) *Vigorously apply existing technologies* in addition to gains made

through reduction in fossil fuel combustion, to reduce (i) emissions of acidifying substances to reach the critical load that the environment can bear; (ii) substances which are precursors of tropospheric ozone; and (iii) other non-CO_2 greenhouse gases.

(h) *Label products* to allow consumers to judge the extent and nature of the atmospheric contamination that arises from the manufacture and use of the product.

Actions by member governments of the United Nations, non-governmental organizations and relevant international bodies.

(a) *Initiate the development of a comprehensive global convention* as a framework for protocols on the protection of the atmosphere.

(b) *Establish a World Atmosphere Fund*, financed in part by a levy on fossil fuel consumption of industrialized countries, to mobilize a substantial part of the resources needed for implementation of the *Action Plan for the Protection of the Atmosphere.*

(c) *Support the work of the Inter-Governmental Panel on Climate Change* to conduct continuing assessments of scientific results and initiate government-to-government discussion of responses and strategies.

(d) *Devote increasing resources to research and monitoring efforts* within the World Climate Programme, the International Geosphere Biosphere Programme and Human Response to Global Change Programme.

(e) *Increase significantly the funding for research, development and transfer of information on renewable energy*, if necessary by the establishment of additional and bridging programmes.

(f) *Expand funding* for more extensive technology transfer and technical co-operation projects in coastal zone protection and management.

(g) *Reduce deforestation and increase afforestation* making use of proposals such as those in the World Commission on Environment and Development's (WCED) report, 'Our Common Future', including the establishment of a trust fund to provide adequate incentives to enable developing nations to manage their tropical forest resources sustainably.

(h) *Develop and support technical co-operation projects* to allow developing nations to participate in international mitigation efforts, monitoring, research and analysis related to the changing atmosphere.

(i) *Ensure that this Conference Statement, the Working Group reports and the full proceedings of the World Conference, 'The Changing Atmosphere'* are made available to all nations, to the conferences mentioned above and to other future events dealing with related issues.

(j) *Increase funding to non-governmental organizations* to allow the establishment and improvement of environmental education programmes and public awareness campaigns related to the changing atmosphere. Such programmes would aim at sharpening perception of the issues, and changing public values and behaviour with respect to the environment.

(k) *Allocate financial support for environmental education* in primary and secondary schools and universities. Consideration should be given to establishing special units in university departments for addressing the crucial issues of global climate change.

SPECIAL LONG-SERVICE AWARDS

The National Meteorological Archives at Eastern Road, Bracknell, was again the venue for the annual presentation of long-service awards by the Director-General to four shipmasters or their representatives; the ceremony was held on Friday 19 May, 1989.

As announced in the April 1989 edition of this journal, the four shipmasters to be rewarded for their long and excellent weather observing contributions to the Met. Office were: Captain T. Fyfe, Ben Line Ltd, Captain D.V. Newlin, Blue Star Ship Management Ltd, Commodore T.D. Ridley, Cunard Steam-ship plc and Captain M.J. Godbehear, P. & O. Containers Ltd. The Director-General, Dr J.T. Houghton, CBE, FRS, accompanied by Directors and other Met. Office staff, was pleased to welcome the first three named, together with Mrs Ridley, Mr B.D. Crisp, U.K. Director of Cunard Line, and senior officials from the other shipping companies represented.

In his introduction, Dr Houghton made the following informal address:

'We all hear a great deal these days about the dangers of the "greenhouse effect", and I am inevitably caught in the greenhouse vortex, which is a political vortex, gathering momentum by the day.

'The question is often asked: What evidence have we that the Earth is warming up? Do we have evidence of it? If you look at the evidence of the past forty years, we have measurements from land stations with Stevenson screens, but they are open to question because of the difference of exposure, such as having trees round them. Therefore the question is asked: Have the thermometers been read correctly and uniformly over the last hundred years? Though the levels show warming of around a half of one degree [C], that is obviously open to question.

'A better measurement might be sea levels but these are not easy to determine. A very useful measure is the sea temperature, but questions are asked about that too because of the nature of the buckets which have been used for the purpose over the last hundred years. There have been wooden buckets and canvas buckets and maybe all sorts of buckets, that have been on loan from the Meteorological Office. Nevertheless, there is a very good record from a large number of ships over the last hundred-plus years, and some people in the Met. Office have been studying that rather seriously, with corrections for different sorts of buckets. They found a method of doing that successfully and possibly the best record we have of the way in which climate has changed and is changing comes from the ocean surface temperature. The answer that we get, looking at the last hundred years, is a bit equivocal. The '80s have shown a little warmer sea than we had before by a few tenths of a degree but it is certainly not very conclusive so far, and, looking to the future, measurements from the sea will clearly continue to be absolutely vital if we are going to see the way in which the climate of the Earth might be changing. That is just one illustration of the importance that we place on accurate, consistent, regular and reliable measurements from ships.

'It is now therefore my particular pleasure to welcome the shipmasters here today to receive their long-service barographs. In order to qualify for this barograph award, the period considered is the twelve months to the end of 1987, the qualifications are a minimum of 18 years voluntary observing and the completion of at least one meteorological logbook in the year in question. This special long-service award scheme has been implemented annually since its introduction by the Meteorological Office in 1948.'

Dr Houghton then presented inscribed barographs to the three Captains present, and finally to Captain J.R.G. Hannah, Marine Manager of P. & O. Containers Ltd, on behalf of Captain Godbehear who was unable to be present as he was at sea on board his command, m.v. *Tokyo Bay*.

During the reception the visitors were invited to inspect the many historic records placed on display in the Archives Reading Room for the occasion, such as Admiral Beaufort's original draft of his wind scale, which he wrote in the log of H.M.S. *Woolwich* in 1806, and one of the three remaining logs from H.M.S. *Beagle* from about the time when Charles Darwin made his scientific voyages of discovery with Captain Robert FitzRoy in the 1830s. The visitors were later entertained to luncheon by the Director-General and afterwards were shown around the more interesting parts of the Bracknell Headquarters of the Met. Office.

AURORA NOTES OCTOBER TO DECEMBER

By R.J. Livesey

(Director of the Aurora Section of the British Astronomical Association)

Table 1 lists the observations sent in to date by marine observers. In Table 2 are licsted the principal aurorae for the period. For the purpose of deciding what will be included as a principal aurora, the number and distribution of observers together with the intensity and location of auroral activity and the degree of disturbance to the Earth's magnetic field have all to be taken into account. Some events are quite clear cut, but occasions arise when only one or two observers

Table 1 — Marine Aurora Observations October to December 1988

Date	Ship	Geographic Position	Time (GMT)	Forms in Sequence
4/5 Oct.	*Appleby*	60° 24′N, 14° 12′E	?	aN
4/5	*Sea Searcher*	65° 30′N, 10° 42′E	2145–0000	aRB, RR
9/10	*Norna*	58° 30′N, 06° 37′W	0039–0145	qRB, RR, RB, G
9/10	*Sea Searcher*	63° 30′N, 01° 12′W	1930–2100	G, aRB, RR, m_3RB
10/11	*Sea Searcher*	62° 12′N, 00° 30′W	1900–1920	G, HA, mP, RB
10/11	*Norna*	57° 00′N, 09° 10′W	1930–0252	HA, m_2HBpHA, m_1RR
10/11	*Vigilant*	61° 00′N, 00° 40′W	1910–2130	P, HA, RR, Rb, RA, overhead
10/11	*Australian Advance*	34° 37′S, 151° 15′E	1510	aRAm_2P, deep red
10/11	*Australian Star*	36° 43′S, 127° 28′E	1450	G, RR
13/14	*Cumulus*	57° 10′N, 20° 28′W	0400	qHV
14/15	*Cumulus*	57° 04′N, 20° 04′W	0130–0338	qRR, V
18/19	*Cumulus*	56° 59′N, 20° 02′W	0003–0400	qHA, qV

Table 1 (contd)

Date	Ship	Geographic Position	Time (GMT)	Forms in Sequence
11/12 Nov. ..	*Cumulus*	55° 50'N, 10° 00'W	1950–2245	qN
30 Nov./ 1 Dec. ..	*Naticina*	34° 45'S, 115° 14'E	1415	G, RR
16/17 ..	*Cumulus*	56° 17'N, 13° 00'W	0130	qN
28/29 ..	*Cumulus*	57° 03'N, 20° 24'W	2215	qN

KEY: a = active, m = multiple, m_1,m_2,m_3 = 1, 2 or 3 forms, p = pulsating, q = quiet, A = arc, G = glow, HA = homogeneous arc, P = patch, RA = rayed arc, RB = rayed band, RR = ray structure, V = veil.

Table 2 — Principal auroral activity reported to date, October to December 1988.

Date	Time (UT)	Number of Observers	Magnetic Index	Location and Activity of Aurorae*
9/10 Oct.	0830–0351	8	109	North Dakota (5), Scotland (5)
10/11	0800–0349	18	115	North Dakota (6), Winnipeg (6), Faeroe (5), Scotland (6), North Wales (1)
11/12	2000–0050	4	104	West Ireland (1), Kirkwall (1), Finland (4)
18/19	1800–0400	4	57	'Lima' (2), Finland (5)
2/3 Nov.	1830–0203	21	63	North Dakota (5), Scotland (6), Finland (7)
11/12	1850–0049	8	42	'Lima' (1), North Scotland (4), Orkney (5), Shetland (5), Finland (3)
12/13	1850–0100	7	36	Scotland (5), Finland (4)
30 Nov./ 1 Dec.	1108–0000	4	50	Finland (4), Australia (4)
11/12	2048–0045	5	39	North Scotland (5), Finland (4)
14/15	2215–2350	5	43	Elgin (1), Finland (4)
16/17	2025	4	70	North Dakota (5), North Scotland (5)
19/20	1930	3	52	Kirkwall (5), Finland (5)

KEY: The magnetic index is the sum of the daily planetary magnetic index A_p for the day preceding the day of the start to the day of the finish of the aurora.

* Storm Activity Code: 1 = Glow or patch, 2 = Homogeneous arc or band, 3 = Rayed arc or band, 4 = Ray bundles, 5 = Active moving or flaming storm, 6 = Coronal or half-sky, 7 = All-sky storm.

record an event which may appear to have been important, while on other occasions there may be a number of reports referring only to minor activity. Even the activity in the Earth's magnetic field may not prove to be conclusive and a disturbed field may not lead to an important aurora. Earth satellites of course can keep a detailed, continuous watch on the aurora from 'upstairs', but they do not have the fun of stepping out on to the bridge wing, peering through the gaps in the cloud and suddenly finding a good, going aurora to watch. Keep looking, for it is all happening, and next quarter's report is going to be even more interesting.

The auroral storm of 9/10 October was the precursor of a world-wide event on the following night of the 10th/11th when we had a good response from ships at sea in both hemispheres. The observations from the m.v. *Sea Searcher* in Faeroese waters were made by two marine biologists who, enchanted by what they saw, prepared notes and sketches and sent them directly to the Aurora Section. This was a clear-cut case of an important aurora with many observers world wide, plenty of activity and a very disturbed magnetic field.

The auroral storm of 2/3 November had a special interest in Scottish waters. At 1835 GMT at Edinburgh and Leith there was a sudden flash of activity consisting of brilliant rays and an arc which lasted for about 10 seconds before being followed by some quiet activity. At 1900 there was a second flash of activity followed by quiet arcs, glows and rays. Perusal of the Lerwick magnetic records kindly supplied by Dr W.F. Stuart, of the British Geological Survey Magnetometry Research Unit at Edinburgh, showed that the first flash aurora coincided with an impulsive momentary strengthening of the horizontal magnetic field component. The second flash aurora coincided with an impulsive reduction in magnetic field strength. In north Scotland, auroral activity continued for some hours into the evening, and at one time, a brilliant-white auroral arc made a short-lived appearance. It was reported to be active and brilliant at Helsinki between 1830 and 2119, and was brilliant and overhead at Oulu in the Gulf of Bothnia at 1850, while filling half the sky at times between 1807 and 1920 in the region of Inverness. A copy of the magnetometer trace is given in Figure 1.

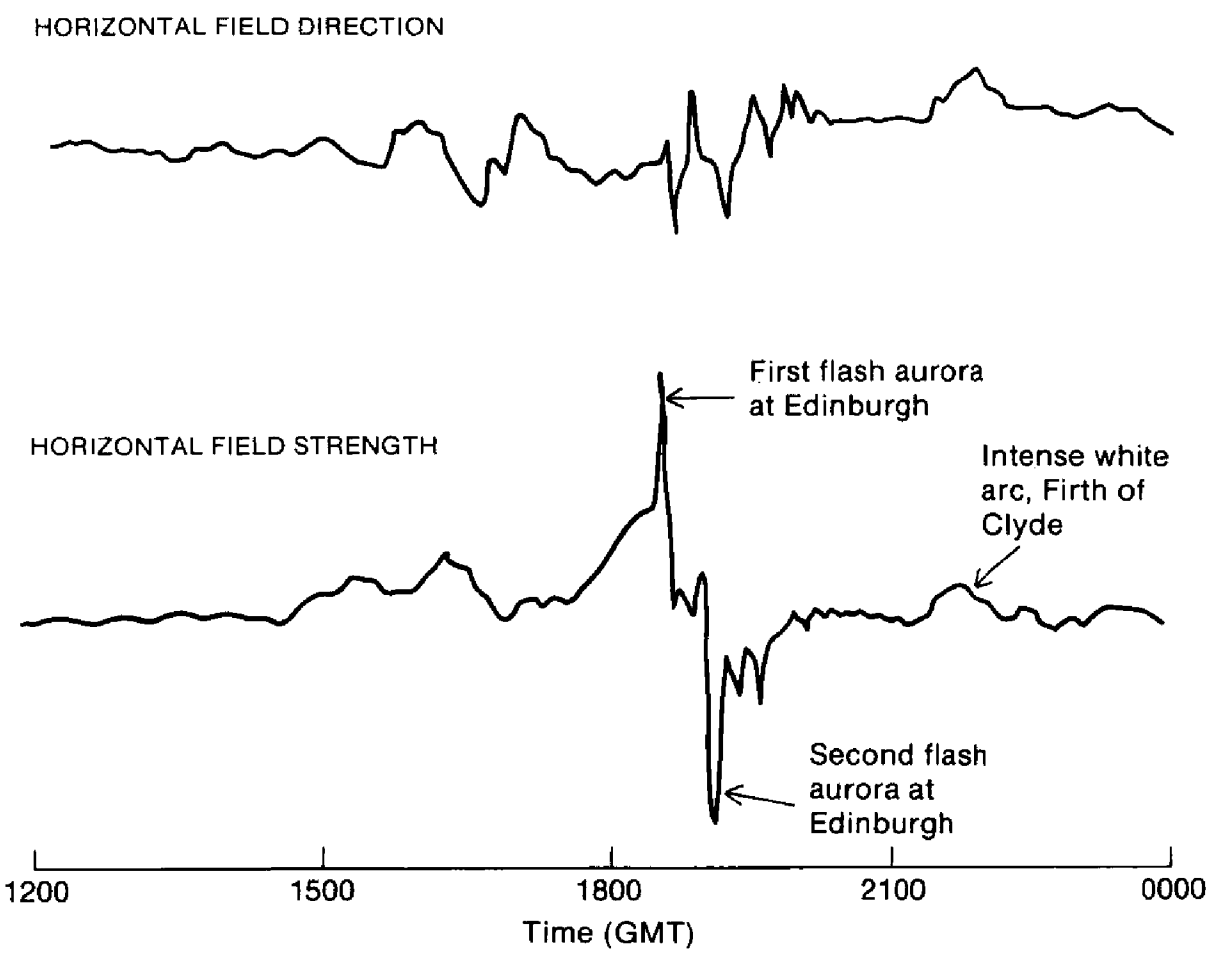

Figure 1. Lerwick magnetogram for the evening of 2 November 1988. (After the British Geological Survey Geomagnetism Research Unit, Murchison House, Edinburgh.)

On 30 November/1 December an aurora was reported in Australia, near Canberra, and photographs revealed blood-red rays and veils. Note that on the night of 10/11 October, the m.v. *Australian Advance* had also reported deep-red aurorae. No auroral activity was reported from European observers except in Finland where rayed structures had been seen. The Earth's magnetic field was disturbed, not unduly so, but there was a marked lack of European activity. It was very much an Australasian event.

A feature of more recent aurorae at the end of 1988 and in the beginning of 1989 has been the appearance of a great deal of red rays, glows and veils, etc. 'Blood-red' is a good description, although when different reactions take place in the same line of sight with the observer, pinks and other variations are seen. Going through early mediaeval and Renaissance descriptions of European aurorae, and further back into Roman times, one is struck by the number of times auroral forms are described as being blood-red in colour. In those times of history, aurorae and comets were taken to be signs of doom and gloom from heaven giving advanced warning of calamity. Was it not Otto the Great (936–973 A.D.) who died immediately after the apparition of a fiery aurora? I have on file this very year the description of an overhead aurora made by a lady member of the public who saw it as she crossed a public park, and took fright, not knowing what it was at first; visions of the supernatural, nuclear war and other calamities raced through her head as she made a hasty retreat to get indoors. Even hardened observers cannot help but be impressed.

In Figure 2 are plotted the annual frequencies for Liverpool and Aberdeen with which auroral light in one form or another might have been seen in the years 1962 to 1988 given that skies were always clear of cloud. The graphs are prepared

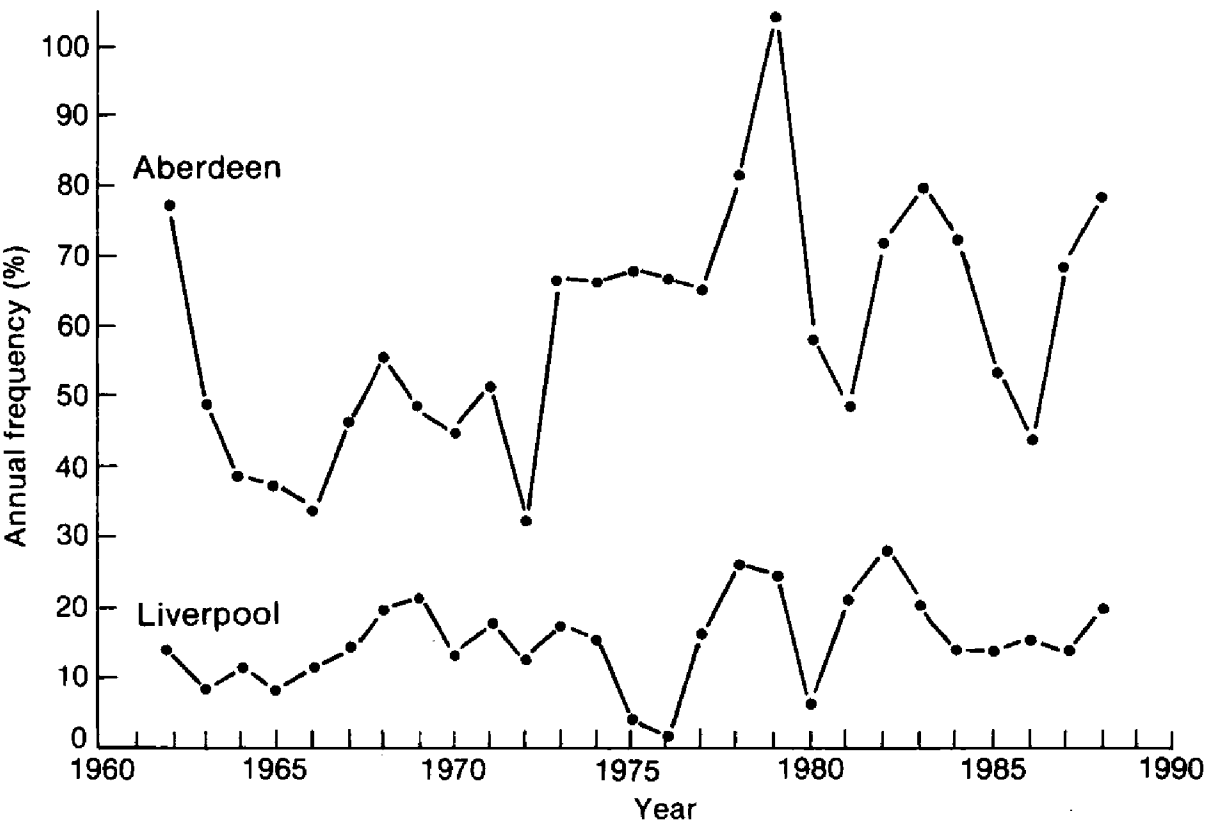

Figure 2. The annual frequency with which auroral light might have been seen at Liverpool and Aberdeen, given clear skies on all nights.

by aggregating all the observations received in each year for the North Atlantic area on the assumption that if an aurora was seen at one latitude, then it existed for all other latitudes polewards to the auroral zone. It will be noted how the auroral activity is rising now with the development of the sunspot cycle. There has been a tendency during this cycle for the magnetic and auroral activity to be quiet relative to sunspot numbers, but recently the sun, and hence the Earth's response to solar events has become more active.

From *The Marine Observer* 40 years ago

SEA SMOKE

Approaching Newport News, Va.

s.s. *Fort Spokane*. Captain A.B. Fasting, R.D., R.N.R. New Zealand to London via Panama. Observer, Mr. M.V. Meardon, 2nd Officer.

27 December 1948, 1510 GMT. During the morning watch and early part of the forenoon large clouds of steam were given off by the sea and visibility was somewhat limited near the surface. This was due to the warm Gulf Stream and the cold air temperature, and is known by seamen as a 'barber'. Farther ahead the sea was a deeper shade of green and there was no steam. In the warm water area the following observations were made: sea temperature 73 °F., air 44°, depth 55 fathoms. Six minutes later: sea 50°, air 43°, depth 52 fathoms. The current was seen to set in a ENE direction as far as the horizon. Course 356° (T). Speed 10 knots.

Position of Ship: Latitude 35° 13'N., Longitude 75° 02.5'W.

So ends our occasional series of items repeated from previous editions, to mark the 40th anniversary of the journal since the Second World War.

LETTERS TO THE EDITOR

Lightning or not ?

Having just read the January 1989 issue of *The Marine Observer*, I was interested to see one of my reports published, I refer to page 25 and the 'Unidentified Light' from the *Falklands Desire*.

This report was written in the additional remarks section of the ship's meteorological logbook. Mr H. Miles makes the comment, 'unfortunately no meteorological conditions were given'. If the observations pages were referred to, the 0600 GMT observation gives the conditions.

As these flashes occurred between 0517 and 0550, I would have made it clear if the conditions varied to those at 0600.

Mr Miles' comments are helpful, but in my mind, this phenomenon is still puzzling, as I am convinced it was not lightning.

F.F. Kuhn, 2nd Officer, m.v. *Indiana 1*.

Personalities

(Readers are invited to notify the Editor of observing officers retiring from the Navigating and Radio Departments.)

RETIREMENT — MR W.G. CULLEN retired as Port Met. Officer at Liverpool after 25 years with the Met. Office following his 20 or so years at sea.

William Grant Cullen was born in May 1929 and served his time as an Apprentice with Andrew Weir Ltd. On obtaining his Second Mate's Certificate he transferred from Bank Line to Donaldson Bros, sending his first meteorological logbook to the Met. Office from the *Laurentia* in March 1954. He provided a total of ten logs, including nine marked Excellent, receiving an Excellent Award in 1957, before transferring to shore staff with an appointment as Scientific Assistant to the Ocean Weather Ship Office at Greenock, in the days when the Weather Ships were operated wholly by the Met. Office. He later transferred to the Marine Branch and was appointed Port Met. Officer at Hull on 2 October 1967. Further promotion followed when he took the Port Met. Officer post at Liverpool in June 1973 and where he became well known to the countless observing ships' staff calling at ports in his north-west England area, until his retirement on 9 May 1989.

We wish Grant Cullen and his wife Isobel a long and happy retirement, based at their home in Bidston village near Birkenhead.

RETIREMENT — CAPTAIN R.H. JONES retired from the sea on 27 January 1989 after 39 years with the T. & J. Harrison Company. He was the fifth member of his family in three generations to join Thos. & Jas. Harrison Ltd of Liverpool.

Raymond Herbert Jones was born in April 1932 and educated at Ruthin School and Liverpool College, with pre-sea training at Liverpool Nautical College. He first went to sea as a Deck Cadet in December 1949 on s.s. *Atlantian* of T. & J. Harrison and went on to serve all his career with that company, except for two years when he was seconded to Ellerman Lines to serve as Master of the jointly owned container ship *City of Durban* from 1981 to 1983. He obtained his Master's Certificate on 27 June 1960 and was promoted to Master on 1 January 1974, taking command of the *Author*.

Captain Jones first submitted a meteorological logbook from the *Herdsman* in July 1955 and in 19 observing years he went on to contribute a further 31 logs, eight of which were assessed as Excellent. He received an Excellent Award in 1982 and another Award for encouraging work in 1988 on board m.v. *C.G.M. Provence* in connection with the special VSOP project log sheets.

Captain Jones wrote of the interesting family association with Thos. & Jas. Harrison Ltd. His paternal grandfather, Walter Herbert Jones, was the first member of the family to join the company, in July 1893, rising to Chief Engineer and retiring in 1930. He had two sons of whom the elder, William Arthur Jones, Raymond's uncle, joined the company in 1921 and also worked his way up to Chief Engineer; in 1943, he was injured as his ship the *Contractor* was torpedoed and sunk off Italy. The younger son, Herbert Walter Jones, M.B.E., Raymond's father, joined the company as a Deck Cadet in 1916, was promoted Master in 1946 and retired in January 1964. Raymond's cousin, Brian Walter Jones, joined in March 1946, became a Master in 1970 and retired 1987. In all, the five members of the family completed an aggregate of 176 years service with Thos. & Jas. Harrison and the family connection is sadly now ended.

Captain Jones' grandfather was a prisoner of war in Germany during the First World War when his ship s.s. *Governor* was sunk by the *Moewe* in 1917. Twenty-four years later his father was taken prisoner, again by the Germans, when s.s. *Dalesman* was sunk by dive-bombers at Suda Bay, Crete, in 1941. He was a prisoner in Germany until the end of the war, during which period he was appointed 'Man of Confidence' on behalf of the Indian, Pakistani, West Indian and other foreign seamen, and it was for this that he was awarded the M.B.E. In 1945 he was sent to Italy to supervise the refitting of the *Dalesman* which had been sunk and raised twice. When the ship was ready he was appointed as Master and sailed in the ship for a further seven years. Raymond's cousin, B.W. Jones, served as Master of the container ship *Astronomer* when she was acting as a helicopter support ship during the latter part of the Falklands campaign.

We are very grateful to Captain Jones for sending us this interesting family story, and we would also like to wish him health, longevity and happiness in his retirement.

RETIREMENTS — We have heard from the Director of Meteorology in Australia of two recent retirements of long-serving Port Meteorological Agents of that country's ports.

MR F.J. TOOK retired as Port Meteorological Agent–Melbourne on 29 March 1989.

Sam Took served for some 12 years in the Navy, mainly as a meteorological observer prior to joining the Bureau in 1961. During his career, he served in all Australian states including all of the islands having Bureau offices and in Lae, New Guinea. Although only three years as PMA–Melbourne, Sam Took established a very good rapport with other meteorological services on taking up his appointment in January 1986, having had a most agreeable liaison with us here in the U.K., and with his New Zealand counterparts.

CAPTAIN C. WHEELER retired as Port Meteorological Agent–Sydney on 8 May 1989 after 24 years with the Bureau of Meteorology.

At the age of 16 Coll Wheeler joined the Australian United Steam Navigation Company as a cadet in 1926. He received his Master's Certificate in 1940 and served for 12 months in the Royal Fleet Auxiliary, then part of the Royal Navy, on an ammunition supply ship. He served 12 years as Master of both cargo and passenger ships. Having joined the Bureau in 1965, he was one of the longest serving PMAs in Australia.

We would like to take this opportunity of thanking our retiring colleagues 'down-under' for their valuable co-operation over the years, and to send them best wishes for a happy retirement. A brief note about their replacements can be found on page 209.

Book Reviews

The Facts on File Dictionary of Marine Science, by Barbara Charton. John Tietjen, Scientific Adviser, Edmund Immergut, Series Editor. Published by Facts on File, New York and available in the U.K. from Facts on File, Collins Street, Oxford OX4 1XJ. 160 mm × 235 mm, 326 pp., *illus.* Price: £15.00.

The author and adviser have used their skills and experience as science reference librarian and professor of biology at City College of the City of University of New York, respectively, to put together a handy-sized reference work embracing most of the facts anyone might want to know about matters marine. With almost 2,000 entries covering such aspects as water chemistry, marine scientists and explorers and their ships, physical features, currents and the plant and animal life that dwells in, upon and over the oceans, it lives up to its claim of being an essential reference source for those working in all aspects of the dynamic marine field. The book would be a useful tool for school and college science students, and for professional marine scientists. The simple text is well augmented by about 75 black-and-white illustrations, mainly diagrams of marine creatures but including evolution tables and maps. To give examples of the range of subject matters included in the book, there are entries for abalone, Nathaniel Bowditch, the American mathematician and navigator, condensation, dolphin, Strait of Gibraltar, lava, Noctiluca, Nansen bottle, pycnocline and symbiosis, to name but a few. On browsing through the book beyond letter 'Z', one comes by chance upon four appendices which expand upon geologic time scale, chronology of marine history, taxonomic classification and marine science research projects. Although the main entries are listed alphabetically as one would expect, there is no index to advise about these appendices and users might refer to the book for some time before coming across them accidentally. That is the only omission to be found in an otherwise comprehensive reference work that bears delving into in spare moments just for increase of knowledge, or for more serious study.

J.F.T.H.

All about Marine Compasses and their Adjustment, by Captain Alan Pickles. Published by A.H. Pickles & Co., 3 Hevron Street, North Fremantle, Western Australia. 180 mm × 27 mm, 55 pp., *illus.*, paperback. Price: £7.45 from Kelvin Hughes bookshops, or A$14.95 in Australia.

With over 25 years compass adjusting to his credit, Captain Pickles has produced the definitive work on the art in this small treasure of a book. Although mainly intended to simplify compass adjusting for the small-boat owner, students for the higher certificates, and indeed professional mariners will find this book of much practical use. For those who have spent hours trying to decipher the true meanings from formulae and diagrams depicting rods and other mysteries in the great textbooks of our time, this is the answer. It covers a short history of the compass, describes deviation in its simplest form and includes a chapter on the gyro compass. The diagrams, coloured where necessary, are clear and uncluttered with extraneous detail and are sufficient in number. There are chapters on advanced compass adjusting and two pro-formae for compass-adjustment calculations.

Alan Pickles has summarized answers to the many questions that ship and boat owners have put to him during his adjustment on over 10,000 craft, ranging

in size from 250,000 ton cargo ships to trailer boats and is therefore well qualified to publish this informative work. In addition, he was born in Liverpool and trained on H.M.S. *Conway* before spending half his working life at sea with Elder Dempster Lines of the Blue Funnel Group. He is also Port Meteorological Agent at the port of Fremantle and a regular visitor to Bracknell during his trips from Australia to the U.K.

J.F.T.H.

Guide to Port Entry, 1989–1990 Edition. Produced by Colin Pielow, edited by Robert Pedlow. Shipping Guides Ltd, Shipping Guides House, 75 Bell Street, Reigate, Surrey RH2 7AN. 220 mm × 300 mm × 55 mm, 3,500 pp. + indexes + 48 pp. of Late Reports. Price: £155.00.

Now in two chunky volumes, this esteemed publication comes out in linen binding in its tenth major edition, making it easier to lift from its chartroom or boardroom shelf than its hardbound predecessors, dating from 1971 onwards. Consulted often it certainly will be, containing as it does all the information necessary to shipmaster, charterer or superintendent on the world's commercial ports. It now includes small-scale port and larger-scale berth plans, or sketches, adding to the mass of textual information, ranging from port details to Customs allowances, documents required and planned developments. When one tires of the dry facts of port facilities, one can find much professional interest in the Shipmasters' reports of actual conditions experienced at many of the listed locations. These provide a realistic adjunct to the main entries; and it goes without saying that the editor relies very much upon advice of new information to help in keeping the Guide up to date for the good of all its users.

J.F.T.H.

Notices to Marine Observers

OLD SEA-SURFACE TEMPERATURE BUCKETS REQUIRED

The Director-General spoke of sea buckets at the barograph awards ceremony in May last. He mentioned the difficulties of reconciling sea-surface temperatures taken by different types of ships' buckets over the last hundred years or more. Now the section of the Synoptic Climatology Branch of the Met. Office that is assessing climatic trends makes the following plea:

Wanted for scientific research

Nineteenth century ships' buckets, especially wooden ones used for taking sea temperature. Canvas buckets also of interest. Photographs would be useful. Please contact Mr D.E. Parker, Met O 13, Meteorological Office, London Road, Bracknell, Berks RG12 2SZ.

Note: The Editor of *The Marine Observer* would also be pleased to hear of anyone who has an old bucket to spare, or can write to us about any other historic weather instruments they may have in their possession.

APPOINTMENTS OF NAUTICAL STAFF TO THE MARINE DIVISION AT PORT MET. OFFICES AND BRACKNELL HEADQUARTERS

Following the retirement of Mr W.G. Cullen, Captain A. Britain has been promoted and transferred from Hull to Liverpool as Port Met. Officer. Albert Britain served with the New Zealand Shipping Company and P. & O. S. N. Company before joining the Ocean Weather Ship Service in 1979, becoming the administrative Officer of that service in 1982, based firstly at Fleetwood and later having a dedicated office at Greenock from which the Ocean Weather Ship *Cumulus* is administered.

Captain G. Hindmarch has joined the staff and was appointed Port Met. Officer at Hull on 26 June 1989.

Geoffrey Hindmarch underwent pre-sea training at South Shields in 1965/66 and served his apprenticeship with Shaw Savill and Albion Co. Ltd. After obtaining Second Mate's he joined Sir R. Ropner & Co. Ltd, serving in bulk/car carriers and a product tanker, becoming involved in the preparation of the first of 11 met. logs on m.v. *Norse Viking* in March 1971. After a period on the non-observing ships of Comben Longstaff, Captain Hindmarch was given command of several ships of F.T. Everard & Co., including m.v. *Leicesterbrook* trading to the Falkland Islands and using the Meteorological Observing System for Ships (MOSS) equipment.

Mr S.J. Johnson has been appointed to Bracknell Headquarters as Nautical Officer to become the sixth member of the METROUTE Ship Routeing team, an increase of 100 per cent on staffing levels existing at the beginning of 1988, made necessary by the increase of business gained from several new clients. He will be undergoing familiarization work around various other sections of the Marine Division before joining METROUTE when the senior Ship Routeing Officer retires in 1990.

Stephen Johnson joined Clan Line as Apprentice in 1975, thereafter serving on a variety of ships within the British and Commonwealth fleet until moving to Neptune Shipping on gaining his First Mate's Certificate in 1983. He was promoted Chief Officer in 1985 and obtained his Master's Certificate in 1986. His first met. log came from the *Balmoral Castle* in 1977.

NEW PORT METEOROLOGICAL AGENTS IN AUSTRALIA

Mr G. Wade has replaced Captain Wheeler as PMA–Sydney.

George Wade sailed with British Tankers and after obtaining his Master's Certificate served as Marine Officer and Master with the Nigerian Ports Authority. He emigrated from the U.K. to Australia in 1970, later returning to sea from which he retired in 1987.

The new PMA–Melbourne is Mr M. Hills, replacing Sam Took who retired in March.

Michael Hills was a cadet with Strick Line from 1956, obtained his Master's Certificate in 1965 and Part A of Extra Master's in 1978. His sea career has been followed by 20 years service with the Bureau at various aerodromes in Australia and Papua New Guinea.

STAFF OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE

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Captain R.C. Cameron, Deputy Marine Superintendent. (0344 855913)
Captain J.F.T. Houghton, Nautical Officer. (0344 855916)
Captain M.L.M. Coombs, Nautical Officer. (0344 855915)
Captain C.A.S. Borthwick, Ship Routeing Officer. (0344 854904)
Captain J.A. Williamson, Ship Routeing Officer. (0344 854904)
Captain A.P. Maytham, Ship Routeing and Sea Ice Officer. (0344 854905)
Captain E.J. O'Sullivan, Ship Routeing Officer. (0344 854904)
Captain D.J. Hewitt, Ship Routeing Officer. (0344 854904)
Mr S.J. Johnson, Ship Routeing Officer. (0344 854904)

Marine Enquiries: Meteorological Office, (Met O 1a), Eastern Road Annexe, Bracknell, Berks RG12 2UR. (Tel: 0344 420242. Telex: 849801 WEABKA G. Fax: 0344 485501)

Mr J.S. Hopkins, Head of Marine Advisory, Consultancy and Data Serivces (MACS). (0344 855662)
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Port Meteorological Officers

South-east England — Captain C.R. Downes, Port Met. Officer, Daneholes House, Hogg Lane, Grays, Essex RM17 5QH. (Tel: 0375 378369. Fax: 0375 379320)

North-west England — Captain A. Britain, Port Met. Officer, Royal Liver Building, Liverpool L3 1HU. (Tel: 051 236 6565. Fax: 051 227 4762) (Captain Britain is also Ocean Weather Ship Officer, with an office at the Scotland and Northern Ireland Port Met. Office, Greenock.)

South-west England — Captain D.R. McWhan, Port Met. Officer, Southampton Weather Centre, 160 High Street, Southampton, SO1 0BT. (Telephone: 0703 220632. Fax: 0703 228846)

Scotland and Northern Ireland — Captain S.M. Norwell, Port Met. Officer, Navy Buildings, Eldon Street, Greenock, Strathclyde PA16 7SL. (Tel: 0475 24700. Fax: 0475 892879)

North-east England — Captain D.H. Rutherford, Port Met. Officer, Room D418, Corporation House, 73–75 Albert Road, Middlesbrough, Cleveland, TS1 2RZ. (Tel: 0642 231622. Fax: 0642 242676)

Bristol Channel — Captain A.F. Ashton, Port Met. Officer, Cardiff Weather Centre, Southgate House, Wood Street, Cardiff CF1 1EW. (Tel: 0222 221423. Fax:0222 390435)

East England — Captain G. Hindmarch, Port Met. Officer, c/o Department of Transport, Posterngate, Hull HU1 2JN. (Tel: 0482 20158. Fax: 0482 28957)

Ocean Weather Ship Officer — See North-west England.

Offshore Weather Observing Practices Adviser — Mr I.J. Hendry, Aberdeen Weather Centre, Seaforth Centre, Lime Street, Aberdeen AB2 1BJ. (Tel: 0224 210573. Telex: 73446/7. Fax: 0224 210575.

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